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Commercial Fisheries Abstracts

13 (1)

a monthly summary of important developments for the fishery industries

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Commercial Fisheries Abstracts

DIVISION OF INDUSTRIAL RESEARCH AND SERVICES
BUREAU OF COMMERCIAL FISHERIES

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Following is a brief outline of this filing system. The numbers apply to the first digit appearing on each card. For the meaning of subsequent digits, please see the above described leaflet.

0 General and theoretical	3 Preserved fish	7 Analytical Methods
1 Fish by species	4 Oils	8 Composition
2 Fresh fish	5 Vitamins	9 Miscellaneous
	6 Fishery byproducts	

Use of funds for printing this publication has been approved by the Director of the Bureau of the Budget November 23, 1956.

0.12 PLANT CONSTRUCTION--FLOORS; WALLS; CEILINGS; VENTILATION; LIGHTING

Muir, Allan T.
Canadian Fisherman 46, 20-22, 27-30 (September 1959)

Introduction.--The author, with the aid of experts from the Federal Department of Fisheries and by research into successful practices of sanitation current in other food fields, offers the Canadian fishing industry practical advice and ideas that might be helpful in meeting requirements as set forth by the Canadian Government Specifications Board for the conformance of plants to "Canada Inspected" standards.

Plant design.--If the entire processing area is enclosed in one building, good facilities for sanitation can be provided, and heating and air conditioning will be economical. A one-story building will require a minimum pipe for drainage, easy removal of steam and odors, cheap handling of bulk containers, efficient handling of materials, and a high level of sanitation at a low cost of maintenance. The building should be constructed to prevent, as much as possible, the entry and harboring of rats, mice, flies, and cockroaches.

Floors.--The surface of floors in wet working areas shall be of concrete, asphalt, or other approved material. All floors shall be sloped to drain and shall be properly maintained.

In existing plants, if all other requirements are met, wooden floors might be approved provided they are in good condition and are properly maintained. Such floors must be replaced with an impervious material when extensive repair or replacement is necessary.

Walls.--Inside walls of wet working areas where fish are processed or packaged shall be

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 ABSTRACTER: June H. Olden

0.4 A PHYSIOLOGIC AND CLINICAL STUDY OF FAILURES IN VITAMIN A METABOLISM IN TUBERCULOUS PATIENTS

Getz, Horace R.
The American Review of Tuberculosis and Pulmonary Diseases 72, 224-225 (August 1955) (Reprinted)

A study was organized to determine if nutritional deficiencies in tuberculous patients could be abolished, and if their removal would lead to improvement in clinical progress.

Seventy-eight patients with moderately advanced tuberculosis, all of them showing nutritional deficiencies, were placed on bed rest, with a good hospital diet, and subjected to nutritional study and treatment. None received chemotherapy, collapse therapy, or surgery for tuberculosis while in the study.

At the start of the investigation, most of the 78 patients were found to have abnormally low blood concentrations of vitamin A and vitamin C. Signs and symptoms of vitamin A deficiency were discovered in patients with normal carotene and vitamin A ester concentrations. This suggested failure of the tissues of these patients to convert carotene to vitamin A and to release vitamin A from vitamin A ester.

For purposes of the investigation, the 78 patients were divided into three groups: Group I, with no vitamin supplementation of the hospital diet; Group II, which received the same basic diet as Group I, plus supplementation with vitamin A in the form of the synthetic substance; and Group III, similar to Group II, which received vitamin A in the form of crude cod-liver oil concentrate instead of synthetic vitamin A.

The basic hospital diet, more than sufficient for calorie and protein requirements, with more

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 Author's summary

0.32 STRUCTURE AND FUNCTION IN MYOGLOBIN AND OTHER PROTEINS

Kendrew, J. C. (Medical Research Council Unit, University of Cambridge, England)
Federation Proceedings 18, Part I, 740-751 (July 1959)

Studies are revealing the general structure of protein molecules, even though structural details are not known. Studies are being made on partial or complete amino-acid sequences of proteins and polypeptides. In the past 25 years, properties and behavior of proteins have been subjected to intensive studies by both chemical and physicochemical techniques. It soon should be possible to compare in detail the results obtained by these methods with the known features of the structure. For example, in the case of myoglobin, various laboratories are studying myoglobin to correlate their findings with what is already known about the structure.

Myoglobins from different species have amino acid compositions that are broadly similar, but that differ in detail. Crystallization of different myoglobins have shown that those from two different species crystallize in forms so similar that their X-ray patterns are virtually identical. Sperm-whale and porpoise myoglobins are almost indistinguishable. Horse and seal myoglobins also are similar. This near identity of crystal form and diffraction of myoglobins from different sources implies a near identity of the molecules, which can differ at most only in one or two side chains. In other pairs, completely different types of crystal are formed. For example, sperm-whale myoglobin and seal myoglobin have different symmetries and quite different X-ray patterns. The main features of seal myoglobin can be reproduced by inserting the molecule of sperm-whale myoglobin into the seal myoglobin crystal lattice in the correct position. This can be done if the orientation of the haem group relative to the crystal axes in the two forms is known. Since an almost exact reproduction can be obtained, the two molecules must be virtually identical in their general lay-out, even though the primary structures differ and the amino acid compositions are known to differ appreciably. Research workers

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 ABSTRACTER: Neva L. Karrick

0.7 ADVANCES IN OUR KNOWLEDGE OF PROTEIN AND AMINO ACID REQUIREMENTS

Harper, Alfred E.
Federation Proceedings 18, Part II, 104-113 (July 1959)

Amino acid and protein requirements are currently reported on a relative rather than on an absolute basis. These requirements may be influenced by such factors as the accuracy of the method used to determine the requirements, the method of reporting the requirements, the physiological state of the experimental subjects, and the nature of the diet. A basis for reporting requirements is needed in which the values are not seriously influenced by these various factors. Amino acid and protein requirements and ideal amino acid and protein intakes can be defined only within narrow limits. The author discusses these under four general topics.

Limitations of methods used for determining amino acid and protein requirements.--Requirements of the growing animal usually are determined by measuring the minimum amount required to support maximum growth. Growth response is plotted against increments of amino acid that limit growth. A subjective decision must be made as to which point on the curve should be selected, and different answers lead to differences of opinion regarding the minimum requirement. Studies on the adult animal measure the minimum amount of protein or amino acid required to maintain nitrogen equilibrium. Results also are influenced by the nutritive status of the individual. The minimum requirements of the growing child have been obtained. The problems of determining the difference between minimum and optimum values, and the effects of excessive protein intake, however, still remain.

Methods of reporting amino acid requirements.--Requirements are usually expressed as percentages of the diet, however, changes in diet will affect the values. Type of carbohydrate used,

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 ABSTRACTER: Neva L. Karrick

PLANT CONSTRUCTION

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PROTEIN REQUIREMENTS

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have noted that positions in the molecules of sperm whale and of seal myoglobins that are taken up by the heavy atoms are the same if the heavy atoms are tucked away into the crevices of the molecules; however, if the heavy atom settles on the outer surface, it goes to a different site in the two forms.

In the myoglobin crystals from sperm whale and seal, the molecules are packed in different ways and approach their neighbors at quite different regions of their surfaces, so that they must be subjected to quite different stresses. Thus, even though the structure of a protein molecule depends somewhat on its environment, probably the structure in crystalline form is closely related to the physiological protein molecule.

A description is given of the present thinking on the four levels of organization of protein structure.

Although short-cut methods are being developed, detailed analysis of the crystal structure of a single protein still takes 5 to 10 years. Many important proteins have not been crystallized. Determination of the amino acid sequences of proteins is also difficult and time-consuming; however, an understanding of the behavior of protein molecules in terms of a known chemical structure eventually should be possible.

Electron-density projections are shown of unit cells of sperm whale and seal myoglobins.

0.7

level of fat in the diet, and protein-to-calorie ratio will influence the requirements. Recommended allowances for man are expressed as grams per kilogram of body weight, but a relationship between requirement and body weight cannot be demonstrated. One important factor may be the relative proportions of fat to muscle.

Influence of physiological state. -- Among factors that may affect requirements for individuals are stage of growth, lactation, and reproduction, state of depletion, work (probably no effect), and calorie intake.

Influence of type of diet on protein requirement. --Some evidence exists that amino acid requirements increase as the level of dietary protein increases. An excess or deficiency of one amino acid in the diet can change observed requirements for other amino acids. An adequate supply of nitrogen from nonessential amino acids must also be present in the diet. Requirements will also be dependent upon the digestibility and biological value of the protein source in the diet.

0.12

constructed of approved material, and such walls shall be smooth, waterproof, and light colored. Such walls shall be so constructed as to permit extensive washing up to a height of not less than 4 feet.

The interior surfaces may be of tile; metal sheathing with tight seams and free from rupture; concrete; plaster; or painted wood or equivalent material with a smooth, washable, waterproof, light-colored surface.

Ceilings. -- Ceilings of rooms and working areas where fish are processed or packaged shall be of such material, construction, and finish as to permit their efficient and thorough cleaning. The ceilings of the lower floors of multistoried buildings shall be dust-tight to the extent that vibrations cannot cause dust to go through the floor to the room below.

The joists or rafters of single-storied buildings should be made of smooth lumber and painted with a light-colored paint or should be made of some other material that is easily cleaned such as smooth metal.

Drainage. -- Drains shall be of adequate size and of suitable type. Where connected to a sewer, drains shall be equipped with traps.

Drains should be of smooth impervious material and should be large enought to carry all waste without danger of obstruction or overflowing. They should be constructed in conformity with local building codes.

Ventilation. --Adequate ventilation shall be provided in working rooms. Sufficient ventilation should be provided to eliminate odors and discomfort.

Lighting. -- A minimum illuminating intensity of 20-foot candles shall be provided on all working surfaces except candling surfaces in processing or packaging rooms.

Many authorities feel that a 20-foot-candle intensity is not adequate for the type of operation involved in fish processing. The general lighting system should allow uniform distribution of light over the entire working area. Such seeing obstacles as glare and harsh shadows should be eliminated. In general, fluorescent lamps will provide better quality of lighting for fish-processing buildings than will filament lamps because of their extended area of relatively low brightness.

0.4 (Cross Reference: 4.89)

than average amounts of vitamins A and C, did not raise the original low plasma concentrations of tuberculous patients in these two vitamins significantly.

Therapy with vitamin A produced slow and irregular responses in vitamin A blood concentrations. The response was much better with the cod-liver oil concentrate than with synthetic vitamin A.

All patients in the group which received the cod-liver oil concentrate (Group III) had a good clinical course and were discharged as inactive cases of pulmonary tuberculosis. There were no clinical failures. In contrast, clinical failures occurred in both the control group and the group which received synthetic vitamin A.

Vitamin A metabolism in tuberculous patients. --Ibid. 73; April 1956. Since the publication of our paper, "A Physiologic and Clinical Study of Failures in Vitamin A Metabolism in Tuberculous Patients" (Am. Rev. Tuberc., 1955, 72, 218), we have had several inquiries requesting data for a synthetic vitamin A versus natural vitamin A controversy. We feel this misinterpretation of our data warrants clarification by us.

Neither natural vitamin A nor synthetic vitamin A seems to be the tuberculosis healing factor, as our previous publication in the Proceedings of the Society for Experimental Biology and Medicine (38, 543 (1938)) entitled, "Cod Liver Oil Therapy in Experimental Tuberculosis" pointed out. An oil with a high vitamin A content (halibut liver oil), an oil with a high vitamin A and D content (tuna liver oil), and a low potency cod liver oil were used, and only the cod liver oil showed the healing action. Later, a molecular distilled vitamin A (from cod liver oil) and an oil rich in vitamin A_2 (burbot liver oil) were used and both failed to demonstrate the healing action. These last two observations were not published previously but are mentioned now as they may help to clarify the situation.

The tuberculosis healing factor in cod liver oil can be concentrated by saponifying the oil. The factor is found in the nonsaponifiable residue along with vitamins A and D, sterols, hydrocarbons, and other unknown substances. Further chemical and animal studies are in progress, attempting to isolate and identify the active material. Our previous clinical study reported in the Review (1951, 65, 381) entitled, "A Study of the Relation of Nutrition to the Development of Tuberculosis," as well as the paper under discussion, would indicate that the healing substance is closely associated with vitamin A.

2.1121 NEW TYPE TRAWL DOORS

Anonymous
World Fishing 8, 58 (May 1959)

More than 3 years of research and tests have been put into two new types of trawler otter boards now in full production at Grimsby.

For use in ships of 120 ft. and upwards, the doors range from 10 ft. by 4 ft. 2 in. to 11 ft. by 5 ft. 6 in. The 10 ft. door weighs 14 cwt. approximately.

One of the doors is of the conventional oblong type, while the other is oval. The main feature is that their framework is of all-welded construction. The wooden planking is enclosed in a metal structure of special design in place of the usual top planking, and the bottom wearing sole can easily be renewed at sea. By a simple adjustment of the triangles, the doors are reversed so that they can be used at either the forward or after door, which reduces the number of spares carried.

The new types have been designed to meet the present trend of greater power in trawlers and the tendency to fish on rougher ground, which causes considerable damage to the conventional door. The design does away with the need for tightening up bolts on the doors which could amount to a number of hours in a fishing trip. The new oval shaped board has also been designed to avoid damage to underwater cables and both types have been thoroughly tested for over 18 months without trouble. One ship made 33 trips to Faroe with one set of these doors.

If the boards are damaged they can be repaired much more quickly and cheaply than the conventional type. The latest modification ensures that they can be repaired at sea if necessary. For long

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Reprinted in part

2.1471 CONTROL OF THE MIDWATER HERRING TRAWL

Anonymous
World Fishing 8, 44-46 (June 1959)

It is possible for a trawler to follow a shoal with the echo sounder showing fish under the keel and yet haul up an empty trawl. This may be explained by the effect of altering the course on the path of the trawl. From a study of the accompanying sketch it can be seen that even when the towing vessel sails directly over the school, the trawl may miss it completely.

The drawing (figure 1, see over) shows the effect on the path of the trawl of a change of course by the vessel of 30 degrees. The horizontal difference between trawl and ship is 1,000 meters, equal to warp length of 575 fathoms, and the distance from the shoal is 400 meters. The width of the shoal is 250 meters.

Turning the vessel more than 35 to 40 degrees at a distance of 300 to 400 meters from the shoal resulted in missing the shoal with the trawl. The correct procedure therefore is to aim for the heart of the shoal and to avoid sharp changes in direction while doing so. It also is essential that the drift of the trawler be calculated if accurate control is required because drift has the same effect on the trawl as altering the course.

It is extremely important that the running depth of the trawl be set correctly in its relation to the shoal. The trawler runs over the shoal and fixes its depth by the use of the echo sounder. After pinpointing the densest part, the vessel turns on to the shoal and pays out the trawl warps. In order to be sure which part of the shoal is the densest it is necessary to reduce the amplification on the echo sounder while running over the shoal. If this is not done, the shoal trace shows as a dense black smudge.

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ABSTRACTER: Kathryn L. Osterhaug

2.143 ELECTRICAL FISHING

Anonymous
Canadian Fisherman 46, 40, 42 (September 1959)

Introduction.--The idea of electrical fishing is based on the sensitivity of fish to small charges of electrical current that are passed through the waters they inhabit. As additional current is applied, this sensitivity is increased until it reaches a point at which the fish are immobilized to such a degree that they can easily be captured with a dip net or other suitable device. In this article are discussed reaction to currents, reason for reaction to currents, and practical use of electrical fishing.

Reaction to currents.--Electrical fishing is conducted through the use of direct current; alternating current, and interrupted, or pulsating, current. When direct current is first turned on, fish within the immediate area of the electrodes suddenly jerk their heads, and their bodies seem to vibrate slightly. As the current continues, some of the fish are strongly stimulated and swim toward the anode. If a new pulse is given, all of the fish tend to swim toward the anode. In the final stage of the reaction, the fish turn on their sides toward the anode, and all voluntary movement ceases, the fish being temporarily paralyzed. If the power is increased or continued for some time, the fish die.

When alternating current is used, the fish take a transverse position to the electrical field between the electrodes in such a way as to "tap off" a minimum of voltage. Although it has been noted that alternating current is responsible for producing arrested motion in the fish, It has also been established that this rigidity is caused by a cramp of the muscles and is not a genuine narcosis such as is experienced by fish under the influence of direct current. A pigment contraction also takes place, causing the colors of the fish to fade slightly. Upon removal of the alternating current, the fish seem to be in a hypnotic daze, which soon wears off.

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ABSTRACTER: June H. Olden

3.12 SUBTILIN AND NISIN AS ADDITIVES THAT LOWER THE HEAT-PROCESS REQUIREMENTS OF CANNED FOODS

Campbell, L. Leon; Sniff, Esther E.; and O'Brien, R. T. (State College of Washington, Pullman)
Food Technology 13, 462-464 (August 1959)

Introduction.--As a result of extensive studies, two polypeptide antibiotics have emerged as candidates for further investigation as to their suitability in lowering the heat-process requirements of canned foods. These are subtilin, which is produced by certain strains of Bacillus subtilis, and nisin, which is produced by selected strains of Streptococcus lactis.

Purpose.--This paper is a report of a study made to determine the effect of subtilin and nisin on the severity of heat treatments needed to prevent spoilage of various canned foods. These foods had been inoculated with spores of highly heat-resistant food spoilage bacteria.

Experimental.--Spore suspensions of the putrefactive anaerobe, P. A. 3679, strain H, were prepared in the liver-infusion medium of Stumbo et al. (1950). Spore suspensions of Bacillus stearothermophilus, strain 1518, were prepared on Difco nutrient agar containing 0.1 percent soluble starch. Spore suspensions of Bacillus coagulans, strain 43P, were prepared on the proteose peptone acid agar of Frank (1955). All spore suspensions were harvested as described by Frank and Campbell (1957) and were stored at 40° F. in bottles containing glass beads.

Pea puree was prepared from frozen, grade B green peas. Cauliflower puree was prepared from frozen, grade A cauliflower. Whole-kernel corn was prepared for processing from frozen, grade A corn. Tomato juice and cream-style corn were canned products.

The thermal resistance of spores was determined in the presence and absence of antibiotics in

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ABSTRACTER: Martin Heerdt

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Interrupted current is delivered in a short series of shocks or pulses. This current can be administered in the following forms: rectangular pulse, unperiodic pulse, sinus-curved pulse, or condenser discharge. This type of current is more effective than continuous direct current in attracting fish to the anode.

Reason for reaction to currents. --According to the findings of E. Halsband, reaction to currents is caused by a polar stimulation of the nerves. According to the Pflüger principle, when the circuit is closed, the fish are stimulated within the range of the cathode and as a result move toward the anode. When the circuit is opened, the fish are stimulated within the range of the anode and move toward the cathode, but only if the difference of the stimulative effect between the closing and opening of the circuit is great enough. To produce the proper reaction, current pulses must increase steeply and decline gradually.

Practical use of electrical fishing. -- Electrical current has been used for fishing under the midwater trawl, and it has been used to lead fish into the net from the region immediately beneath it. It enables a normally "unfishable" uneven bottom to be fished. Electrical fishing can be used for removing useless or predatory fish. It can be used as a "fencing in" device against migrating fish so that selected breeding can occur in certain waters: as an electrical barrier for protecting commercially valuable fish, such as salmon, from running afoul of man-made obstacles such as dams, turbines, and pumps; or as a "compulsory guide" to direct fish to new fishways or river systems.

Electric fishing has been carried out with some degree of success by Swedish and German fishermen. In Canada, electrical barriers have been constructed in some of the streams leading into the Great Lakes to eliminate the lamprey, which have decimated lake stocks in recent years. As the technique is improved and perfected, an enormous potential for electrical fishing is predicted for the future.

3.12

the appropriate food substrate for a given organism according to the thermoresistometer technique of Le Blanc et al. (1953). The subculture medium was identical to the heating menstruum. Survival of P. A. 3679 spores was determined by noting gas production in the subculture medium after incubation for 30 days at 85° F. Spore survival of B. coagulans and B. stearothermophilus was determined by measuring the drop in pH of the subculture substrate after incubation for 7 days at 95° F. and 131° F., respectively. D values (the reciprocal of the death-rate constant) were calculated.

Thermal death-time cans, size 208x006 were used in the canning experiments. Each can was filled with 15 grams of food substrate and inoculated with 100,000 spores of the test organisms per gram of material (1.5×10^6 spores per can). For the antibiotic studies, foods were inoculated with 14 p.p.m. of subtilin or nisin. All inoculated foods with and without antibiotics were blended in a Hobart mixer for 10 minutes to ensure even distribution of the spores and antibiotics in the food substrates prior to the canning operation. After being filled, the cans were steamed for 5 minutes in a steam blancher, sealed on an automatic can sealer, processed at the desired time-temperature schedule, cooled with cold running water, and stored in an incubator.

Results. --Subtilin and nisin caused an apparent reduction in the D values obtained with spores of all of the food-spoilage bacteria studied. Campbell and Sniff (in press) have shown conclusively that subtilin and nisin inhibit the outgrowth of germinated spores of B. coagulans instead of reducing their thermal resistance. Since subtilin and nisin have been shown to inhibit the heat-resistant mesophilic spoilage bacteria as well as certain types of thermophilic spoilage bacteria, they can effectively reduce the thermal process needed to control spoilage. Subtilin and nisin may have their greatest application in canned foods in which C. botulinum is not of concern. These include canned tomatoes and tomato paste, canned pears, and canned pineapple. The present U. S. Food and Drug Standards do not permit the use of subtilin or nisin as additives in canned foods.

2.1121

voyages they are particularly suitable and have proved very effective on rough grounds sometimes encountered on the west side of Iceland and Faroe Bank.

2.1471

When several shoals are encountered swimming at different depths during one trawling run, the depth of the trawl must be changed while it actually is fishing. When doing this, consideration must be given to the fact that the trawl passes through the shoal astern of the vessel some time after the vessel has passed over it. This time interval depends on the warp length and the speed of the trawler. Table 2 was worked out by a research team to aid in this calculation.

Table 2

Speed in knots	Warp length in meters			
	639	852	1065	1278
	Minutes			
3.0	5.5	7.5	9.5	12
3.5	4.5	6.5	8.0	10
4.0	4.0	5.5	7.0	9
4.5	3.5	5.0	6.4	8

If it necessary to raise the trawl to a higher level it must be remembered that it will take from 10 to 15 minutes to arrive at the desired depth.

If the difference in depth between shoals is 10 to 14 fathoms it is advisable to reduce speed for a minute or two rather than to let out the warps. By slowing down, the warps will sink 10 to 16 fathoms, and will then rise slowly to the original level.

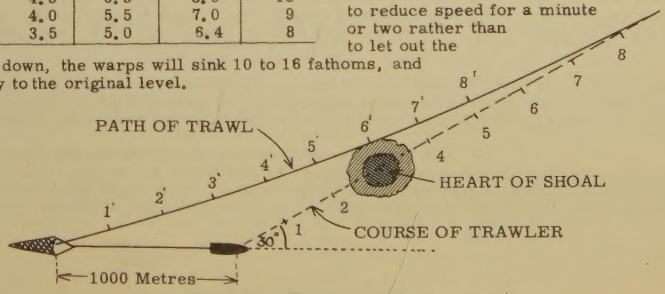

Figure 1. Trawl trajectory on turning

2.1124 TRAP NETS IN THE FRESH-WATER FISHERY - PART 1

Breitenstein, W.
Deutsche Fischerei Zeitung 4, p. 343 (Nov. 1957); Part 2, 4, p. 370 (Dec. 1957); Part 3, 5, p. 25 (Jan. 1958); Part 4, 5, p. 93 (March 1958); Part 5, 5, p. 108 (April 1958) (Neumann-Verlag, Radebeul, Dresden, E. Germany)
World Fisheries Abstracts 10, 9-10 (March-April 1959)

When designing fishing gear, the time taken to manufacture it, consumption of material and efficiency should be considered. Tradition often hampers the development of manufacturing the gear economically. Considering these points of view, the design of several types of traps for fresh-water fisheries in E. Germany is described. Double entry traps have a cylindrical shape. The entrances are in juxtaposition. The traps consist of webbing held by rings. These trap fish successfully only if there are aquatic plants under water and above the water level. The traps are put into passages cut into the aquatic vegetation. Their heights correspond to the average depth of water. Their length depends on the length of the inner valve net, which is related to the height of the trap. Formulae for calculating the sizes of the traps are given. The net material, also that of the inner valve net, is cut from machine-made webbing without any loss. Examples of the cost of the different working methods are given. The most economical working method is not always the cheapest. Since wages are usually the costliest item compared with the price of material, the method needing the least labor is the cheapest.

A similar investigation was made for the cone-shaped fyke nets. These should be designed in such a way that they can be used for taking as many species of fish as possible. Their efficiency is influenced by the size of mesh, the thickness of the twine, the sizes of the several parts of the traps related to each other, the design of the gear and, in certain cases, the color. By using synthetic fibers, especially monofilament fibers, their efficiency can be increased essentially. By using

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 ABSTRACTER: A. von Brandt

3.25 CONTROLLED TRANSIT TEMPERATURE

Partlow, Howard W., Jr.
Frosted Food Field 29, 24-26 (August 1959)

The continued success and expansion of the frozen-food industry depends on the price, quality, and condition of frozen foods when they reach the consumer. The role of transportation can be critical in its effect on these factors.

In order to survive, the transporter, whether he uses trailer, ship, or railroad, must improve his control over temperature during transit.

Basically there are five problems that have to be solved in order to improve the refrigerated transportation of frozen foods:

1. Trucks and trailers and mechanical refrigeration cars for the nation's railroads and cargo containers must be insulated correctly so that the temperature required by processors can be maintained.

2. Refrigeration equipment should be adequate in capacity to assure its ability to maintain desired temperatures during transit under widely varying ambient conditions.

3. Trucks, trailers, mechanical refrigeration cars, and containers must be designed and cargoes must be loaded to provide for maximum circulation of air. Loading and handling techniques must be studied and improved.

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 ABSTRACTER: Kathryn L. Osterhaug

3.2490 STORAGE LIFE OF PINK SHRIMP HELD IN COMMERCIAL AND JACKETED COLD-STORAGE ROOMS

Peters, John A. and McLane, Daniel T.
Commercial Fisheries Review 21, 1-7 (September 1959)

One of the problems in the storage of frozen foods is dehydration. During frozen storage moisture sublimes from the food and is condensed on the surface of the evaporator coils.

Several approaches have been proposed to prevent dehydration of frozen foods by sublimation. These include (1) glazes for unpackaged products, (2) the use of packaging materials that have very low rates of moisture transmission, and (3) increased relative humidity in the air of the storage room. Relative humidity can be increased most easily by enlarging the area of the surfaces used to cool the room. In a jacketed cold-storage room, maximum cooling-surface area is provided by cold air circulating through an enclosed jacket that completely surrounds the space where the frozen food is stored. This construction provides a high relative humidity and minimizes the sublimation of moisture from the frozen foods.

The purposes of the studies reported here were (1) to compare the frozen storage life of (a) individually frozen and glazed, peeled and deveined pink shrimp, (b) block-frozen, peeled and deveined shrimp, (c) individually frozen, headless raw shrimp, and (d) block-frozen, headless raw shrimp held at from 0° to -5° F. in a commercial-type cold-storage room; and (2) to compare the frozen-storage life at 0° to -5° F. of individually frozen and glazed, peeled and deveined pink shrimp stored in a commercial-type cold-storage room, with similarly prepared shrimp stored in a jacketed cold-storage room.

Experimental procedure. --The individually frozen samples consisted of peeled and deveined raw shrimp and headless raw shrimp frozen on trays in a blast freezer, glazed by dipping in fresh water, and packed in 2½-pound-size one-piece waxed paperboard cartons. The cartons were overwrapped with waxed, opaque, bleached sulfite paper.

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 ABSTRACTER: Kathryn L. Osterhaug

3.39 THE MOST POISONOUS POISON

Lamanna, Carl (Naval Biological Laboratory, School of Public Health, University of California, Berkeley)
Science 130, 763-772 (September 23, 1959)

The neurotoxins produced in vitro by Clostridium botulinum under controlled environmental conditions of nutrition, anaerobiosis and temperature are of interest because they are the most potent poisons known. The purpose of this paper is to outline some of our knowledge and unanswered questions on the nature of botulinal toxins.

Clostridium botulinum bacteria are rod-shaped, strictly anaerobic, and spore-forming. They produce intracellularly a neurotoxin that is released into the growth medium after the major increase in bacterial population has been achieved; the function of this toxin in the metabolism of the organism is still a mystery. Since the organism cannot grow within the body of the animal, botulism is of food-poisoning concern, and not an infectious process. The current antigenically distinguishable neurotoxins (A, B, C, D, and E) are each produced by a different strain of Clostridium. Most frequent food poisonings in man have been caused by toxin type A, B, and E. Improperly preserved fish foods have resulted in type E toxin poisoning. Type E bacilli are probably of marine origin, the other types are common to soil.

Chemical nature of botulinal toxins. --The toxins are simple globular proteins that are composed exclusively of amino acids. Only type A toxin has been sufficiently purified for crystallization. It is a white, odorless protein of high molecular weight. Some, but not all, of the common criteria for molecular homogeneity are met by type A toxin.

Botulinal hemagglutinin. -- The various neurotoxin types of Clostridium botulinum produce hemagglutinating substances. The synthesis of hemagglutinin is coincident with toxin production and, in the purification procedures currently employed, hemagglutinin accompanies the toxin. The

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 ABSTRACTER: Max Patashnik

TRAP NETS

STORAGE OF FROZEN SHRIMP

REFRIGERATED TRANSPORT

CLOSTRIDIUM BOTULINUM

Block-frozen samples were prepared by placing the shrimp into 2½-pound-size cartons, flooding with water, overwrapping with the bleached sulfite paper, and freezing in a blast freezer.

A control sample was prepared by packing some of the frozen shrimp into No. 10 C-enamel cans, filling the cans with fresh water, sealing under 27 inches of vacuum, freezing to -25° F. in a blast freezer, and storing at -25° F.

The samples of frozen shrimp were weighed and examined organoleptically at monthly intervals during a storage period of 15 months.

Results and conclusions.--It was found that with the commercial pack, the loss in weight was 1.8 to 2.5 percent after 9 months and 3.6 to 4.4 percent after 15 months. Owing to dehydration, the shrimp stored for 9 months or longer were of unacceptable quality. No differences in storage life were attributed to the style of pack. The control samples packed in hermetically sealed containers and held at -25° F. were of good quality for 6 months longer than were the commercial samples.

The commercial samples of pink shrimp stored at 0° to -5° F. in a high-humidity jacketed storage room were of good quality for at least 3 months longer than similar samples stored at the same temperature in the commercial-type cold-storage room.

Table 2.--Average taste-panel scores on commercially packaged samples of shrimp stored at 0° to -5° F. in a jacketed storage room or commercial-type still-air storage room.

Storage time	Known control 2/	Blind control 3/	Average taste-panel scores 1/ on samples of peeled, deveined, individually frozen and glazed shrimp stored at 0° to -5° F.	
Months			Jacketed storage room	Commercial-type storage room
9	8.6	8.4	8.1	7.3
12	8.0	7.9	7.6	5.9

1/ Scores of 9 = excellent, 8.0 to 8.9 = very good, 7.0 = good, 6.0 to 6.9 = fair, 5.0 to 5.9 = borderline (should not be marketed), and 4.0 to 4.9 = slightly poor (unmarketable).
2/ Stored in hermetically sealed cans at -25° F. Taste panel was informed of the identity of this sample.
3/ Same as known control but identity was not revealed to taste panel.

hemagglutinin produced by organisms of type A and B are reciprocally neutralized by commercially available specific A and B antitoxins. The same is true for C and D types, but type E is neutralized by specific type E only. The hemagglutinin produced by type A has been studied and the applicable data are discussed.

Size of toxic unit.-- The fact that hemagglutinin is found in conjunction with the type A toxin is one of the difficulties that has prevented the isolation of the ultimate toxic particles; therefore, the true size of the ultimate unit remains to be discovered. Although it is a useful working hypothesis to consider crystalline toxin to be an assembly of toxic and inert subunits in association with one or more hemagglutinin units (Wagman and Bateman 1951; Wagman 1954), there is reason to believe that the toxic unit itself will prove to be of the dimensions of a protein.

Toxic potency.--Botulinal toxins are undoubtedly the most potent poisons known. Because these toxins are not general cellular poisons but act at specific sites including the terminal ends of cholinergic autonomic nerves and the neuromuscular junction, and because the number of these sites is not quantitatively proportional to body weight, toxic potency cannot be extrapolated on a weight basis. Toxicity must be empirically determined for each species, and the specific toxin considered. The available clinical data does not permit a scientific statement of the true minimum lethal dose for man.

Toxin as an oral poison.--On the basis of published evidence, we must assume that the small intestine acts as the major site for absorption of the ingested poison. How the large protein toxin molecule can pass through the membranes of the alimentary tract into the general circulation is still a mystery.

Mechanism of poisoning.--Botulism involves a paralysis of the autonomic nervous system. The immediate cause of death usually is a paralysis of the skeletal musculature resulting in interference with breathing and consequent asphyxiation.

The basis of paralysis is specific interference with the release of acetylcholine from the terminal ends of nerves and does not involve events in muscle-nerve physiology that follow upon the release of acetylcholine. The pressing problem in the physiology of botulism in the need to determine the precise site and nature of the reactions leading to the failure of poisoned nerves to release acetylcholine in this irreversible reaction.

thinner twines the frightening effect on fish by the swell of the water can be reduced. For this reason, it is also suggested that the first inner valve net should not be designed in a square shape, as is usually done, but in the shape of a house, for example, like a pentagon as there is less resistance. The design of the fyke nets is described.

In contrast to traps made of net material, the wooden traps now play scarcely any part in the fresh-water fishery. In rivers they are still used for eel fishing and in lakes to catch crayfish. These traps are made of wooden rods (fir), willow twigs or fir roots. As compared with traps made of net material, the wooden traps are too expensive.

4. Personnel must be trained in the proper handling of frozen foods and to meet emergencies.

5. Efficient, reliable temperature control instruments must be used.

Handling techniques.--The refrigeration equipment on trucks and railroad cars should not be expected to reduce the temperature of cargoes. Loading and handling techniques must be developed to a point where frozen foods can be transferred without an increase in temperature. Some of the major problems that must be solved include the following:

1. How to get frozen food from the plant into the refrigerator car without an increase in temperature.

2. How to keep the door of the truck closed enough during the loading period so that the precooled temperature does not rise.

3. How to load frozen foods so that proper air circulation is provided.

Training of personnel.--Poorly trained drivers can be the weak link in the refrigerated transport chain. Some information that the driver must know and understand is as follows: (1) the importance of maintaining the temperature required by the frozen food processor, (2) what to do on the road in the event of emergency, (3) the importance of good air circulation around cargoes, and (4) the importance of keeping frozen foods at prescribed temperature when loading or unloading.

2.114 HYDRAULIC STEERING CENTERS PURSEBOAT CONTROL

Anonymous
National Fisherman 40, 11, 36 (August 1959)

The introduction of the power block to the menhaden industry brought with it impressive changes in techniques and methods. The latest of these is the central helm placed amidships to permit the purseboat captain or mate to operate the throttle, tiller and power block controls while standing in the center of the boat.

Through the ingenious use of two hydraulic cylinders, one attached to a midships vertical control stick, and the other connected to the rudder stock, the boat can be controlled with little effort. The helm can be brought from hard-over to hard-over by simply moving the control stick through a 13-inch arc. The length of rod above the pivot and cylinder automatically increases pressure exerted on it to change the rudder position. At his new vantage point the captain not only has full control of all maneuvering, he also has full and direct control of engine speed, and the net being hauled through the power block sheave.

Users of the new helm say that it speeds boat handling; allows more positive control of pursing; and permits the captain to stand in a more secure location because it takes him off the exposed stern position.

The basic simplicity of the hydraulic helm system makes it virtually foolproof, and it also makes it an economical addition to any purseboat whether it is wood, metal or glass fiber. The only components involved are two small hydraulic cyclinders, hydraulic hose, mounts, bypass valve, and a pivoting control rod or stick.

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4.2 STUDIES ON THE CONJUGATED FATTY ACIDS PART IV. ULTRAVIOLET IRRADIATION ON THE CONJUGATED FATTY ACIDS

Kayama, Mitsu and Tsuchiya, Yasuhiko (Tohoku University, Sendai, Japan)
Tohoku Journal of Agricultural Research 9, 251-262 (February 1959)

Purpose.--Spectrophotometrical studies were made to show that ultraviolet irradiation causes the destruction of the conjugated structure of conjugated fatty acids.

The authors made fundamental observations on the photochemical reactions of one component of the conjugated fatty acids and of a mixture of them, both with and without added vitamin A. Ultraviolet and infrared absorption curves were measured before and after ultraviolet irradiation with a filter and without a filter.

Experimental.--Ultraviolet irradiation treatments were carried out with the Matsuda SHL-100 UV ultra-high-pressure mercury lamp. Most of the ultraviolet irradiations were performed in the 1-cm. silica cell containing the conjugated fatty acids dissolved in pure iso-octane. A potassium chloride demountable cell for infrared spectrography was used to obtain the infrared absorption curves and to irradiate the conjugated fatty acids in a layer of about 30 μ in width. A Matsuda UV-Dlc filter was used to isolate the ultraviolet ray that was used. The ultraviolet absorption curve was measured with a Beckmann Model DU Quartz Spectrophotometer. The infrared spectrum was measured with a Perkin-Elmer Model 21 Infrared Spectrophotometer.

The conjugated fatty acids to be irradiated consisted of a mixture of diene, triene, tetraene, pentaene, and hexaene conjugated fatty acids obtained by the alkali-isomerization of cod-liver oil, Chinese tung oil, and et-α-eleostearate. The last ester was prepared according to the method of

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 ABSTRACTER: Martin Heerdt

4.4 LIPASE ACTIVITY IN LINGCOD MUSCLE PREPARATIONS

Wood, J. D. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Canadian Journal of Biochemistry and Physiology 37, 937-943 (August 1959)

Purpose.--At present, two different theories exist as to the mechanism by which fatty acids are formed in fish. Lovern et al. (1958) favor the theory that the fatty acids are formed by bacterial action. Dyer and coworkers believe that fatty acids are released from lipids by the action of a lipase present in the fish muscle. The authors decided to investigate the occurrence and properties of lipase enzymes in fish muscle because of a lack of information on lipase activity. This paper presents the results of their investigation.

Methods.--The tissue employed in this study was obtained from fresh lingcod (Ophiodon elongatus) and used either at once or frozen and stored at -20° C. until used. Two methods were used to determine lipase activity. Method 1 was based on the manometric determination of the carbon dioxide evolved from a bicarbonate buffer as a result of the liberation of fatty acids by lipase as first proposed by Rona and Lasnitzki (1924). Method 2 was based on the titration of the fatty acids that had been liberated. Protein estimation was performed by either the method of Kingsley (1939) as adapted by Snow (1950) or the method of Lowry et al. (1951).

Isolation and purification of the enzyme.--A weighed quantity of lingcod muscle, either fresh or frozen, was homogenized in three volumes of ice-cold, distilled water and centrifuged at 20,000 times gravity for 20 minutes. The supernatant fluid was collected and designated as the muscle extract. The extract was treated at 0° C. with a 60-percent solution by weight of $MgSO_4$, stirred for 10 minutes, and centrifuged at 20,000 times gravity for 20 minutes. The protein precipitate was resuspended in ice-cold, distilled water and made up to a volume equal to one-fourth of the original extract. The suspension was filtered through glass wool and the filtrate was collected and used in the experiments described in this study.

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 ABSTRACTER: Martin Heerdt

6.14 SPONTANEOUS HEATING OF FISH MEAL--1

Van den Broek, C. J. H. (University of Utrecht, Holland)
Food Manufacture 34, 349-353 (September 1, 1959)

Spontaneous heating.--Heating immediately after drying is a common occurrence in all fish meal produced from fatty fish such as herring, pilchard, and brisling. Fish meal may also heat spontaneously during storage or transport. Difficulties that arise from heating are widespread and well known to fish-meal producers. The amount of heat produced varies with the type of meal, the fat content, and the method of manufacture. Meal from nonfatty fish does not show this particular kind of heating. The data of Harrison (1939) demonstrated a rapid increase in temperature of 50° to 100° F. within the first 6 to 12 hours after the meal was dried.

Under certain conditions, cured fish meal that has been stored for a long time in bags at apparently constant and normal temperature may show a sudden increase in temperature. This sudden heating sometimes produces disastrous results. The very high temperatures that can be reached during the heating of fish meal may lead to ignition. Meal temperatures of 170° to 190° F. have been encountered in cargo vessels that did not have adequate hold ventilation.

Appearance of heated meal.--Below the combustion point, heat damage to the meal appears as a darkening of the color which increases as the temperature rises. In time, the meal gradually becomes caked into a dark-brown solid mass and it may become completely charred. Heated meal usually has a low biological value and a high percentage of undigestible nitrogen.

Factors involved in spontaneous heating.--Fish oils are composed largely of unsaturated fatty acids. These oils are capable of being readily and extensively oxidized. As a result, heated meal

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 ABSTRACTER: Martin Heerdt

4.2

A. W. Thomas and J. C. Thomson (1934) from Chinese tung oil. Crystalline vitamin A and β-carotene also were used in the experiment.

Procedure. -- An iso-octane solution containing the conjugated fatty acids and other materials was introduced into the silica cell, and the ultraviolet absorption of the fatty acids was measured with a Beckmann Spectrophotometer prior to irradiation. The solution then was irradiated for a given time either with or without a filter, and ultraviolet absorption was measured again. For measurement of infrared absorption, samples were put into the potassium chloride demountable cell and measured both before and after ultraviolet irradiation.

Results. --The conjugated fatty acids were destroyed (1) almost completely when the filter was omitted and (2) to a large degree when the filter was used. If the ultraviolet filter was used the unchanged acids appeared in the outer range. Irradiation of a mixed solution of ethyl-α-eleostearate and vitamin A resulted in some selective destruction of fatty acids.

The photochemical reaction could not be reduced solely to the results of oxidation because the destruction of conjugated fatty acids is not inhibited by addition of an antioxidant to the system to be irradiated. Visual ray irradiation of β-carotene and of the conjugated fatty acid system showed that the nearest ray may be isolated within the absorption band of the compound, where the most effective destruction occurs.

Conclusions.--After the destruction of conjugated triene to trans, trans conjugated diene and isolated trans, ultraviolet irradiation apparently causes the trans, trans structure of α-eleostearate, to be isomerized to β all trans configuration.

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gives off a rancid smell that is indicative of excessive oxidation of the fat. Normal spontaneous heating is caused by oxidation of the fat or oil that is left in the meal after the cooked material has been pressed. In the final product, this oil may constitute from 5 to 12 percent of the meal.

Oxygen. --The amount of oxygen available for oxidation of the fat is a determining factor in the rate at which heating occurs. Apparently normal spontaneous heating in freshly prepared fish meal will continue until the fat has been completely oxidized. This process is called curing. If the process of oxidation is inhibited immediately after the meal is dried by very quick cooking, the meal is insufficiently cured; and accidental spontaneous heating may occur after the meal has been placed in storage.

Temperature. --As in all chemical reactions, the rate of oxidation of the fat and the rate of heat production occur more rapidly at high temperatures than at low temperatures. However, a simple relationship has not been found between the rate of heat production and the temperature of the meal.

Use of antioxidants. --Antioxidants that are used to prevent the oxidation of fat in foods can inhibit heat production in fish meals almost completely. No heat was generated by menhaden scrap. either immediately after it left the drier or after it had been quickly cooled before being cured when 1 pound of butylated hydroxytoluene (BHT) was added to each ton of scrap as it left the drier. Santoquin (6-ethoxy-1, 2-dilhydro12, 2, 4-trimethylquinoline) sprayed over the press cake or over the dried scrap during the production of Alaskan herring meal prevented heating of the meal to such an extent that bulk shipping immediately after drying appeared to be possible.

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The helm consists of two $10\frac{1}{4}$-inch stroke hydraulic cylinders, one mounted at the rudder stock, the other beneath the midships thwart--though the second unit can be placed anywhere it is convenient. The units are precision made of corrosion-resisting material to assure long and dependable life. The cylinder bodies are made of brass tubing. The end pieces are machined from brass bar stock and are secured by four studs. The studs are the same length as the cylinder body and hold both heads firmly in place. The interior of the tube is highly polished.

The piston rod that is responsible for moving the fluid is 9/16-inch Monel nickel-copper alloy. Besides being resistant to corrosion, Monel provides the high strength required of the rod while in service. The rod is precision-straightened and hand polished with emery cloth, oil, and jeweler's rouge before being installed in the cylinder. With the piston rod inserted, the over-all length of each cylinder is $32\frac{3}{4}$ inches. The cylinders are connected together by 5/8-inch O. D. copper tubing or $\frac{3}{4}$-inch I. D. flexible hydraulic hose, fastened securely every few feet to prevent vibration fatigue.

Each cylinder is factory furnished to make it self-aligning. This is accomplished by a system of pivot points. The bracket that holds one end of the cylinder in place allows it to pivot slightly. The Monel rod is connected to the rudder arm by a universally mounted trunnion with a double shackle. This flexible arrangement is to keep the cylinder and rod from getting out of alignment and causing excessive wear or bending of the rod. The remote cylinder is mounted in the same fashion, but instead of the free end being attached to the rudder arm, it is attached to the control bar or stick.

The bottom end of the bar is pivot-mounted while the midships cylinder clevis is attached far enough above the pivot point to allow the control bar to move the rudder from hard-over to hard-over through a 13-inch arc. The leverage provided by the bar triples the pressure transmitted to the rudder stock.

The cylinder at the rudder controls the stock through a 7-inch long rudder arm bolted to the stock. The rudder arm travels through a 90-degree angle--or 45 degrees on either side of dead ahead. This angle can be increased or decreased by shortening or lengthening the rudder arm. Rudder travel is further controlled by the metal guide plate which holds the tiller bar. The length of the guide plate slot governs the amount of rudder travel. The limits of the slot are, in effect, rudder stops.

Maintenance of the hydraulic helm is simple. All it requires is a few drops of clean engine oil once a month on the exposed areas of the piston rod, clevis and pivot pins.

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Results. --A five to tenfold purification of the enzyme was obtained by the above method, but the activity of the enzyme recovered was low. A second precipitation, with $MgSO_4$, resulted in no further purification and a decreased yield of enzyme. The purified enzyme preparation was somewhat unstable in aqueous solution; however, a significant loss in activity did not occur when it was dialyzed overnight against water at 0° C. Loss in activity as a result of dialysis was reduced but not eliminated by dialysis against 0.01 M $MgCl_2$. The addition of $MgCl_2$ to the enzyme preparation that had been dialyzed against water did not restore the loss in activity. The enzyme preparation could be kept at -20° C. for 4 weeks without loss of activity.

The lipolytic activity of the enzyme preparation, estimated on the basis of the monometric method, increased with pH throughout the pH range 6.34 to 7.84. A higher pH range that was studied by the titrimetric method showed that optimum activity occurred at pH 8.2.

The rate of hydrolysis of triacetin over the range 5° to 45° C. increased with temperature. At 45° C. and to a slight extent at 35° C. a decrease in the reaction rate was observed during the course of the 1-hour incubation. The loss in activity at the higher temperatures was caused by a destruction of the enzyme.

The effect of lingcod muscle lipase on different substrates showed that both monoglycerides and triglycerides were hydrolyzed readily but that methyl acetate and ethyl acetate were hydrolyzed extremely slowly, if at all. Triglycerides that contained long chain fatty acids such as trioctanoin were not attacked. Olive oil, halibut liver oil, and lingcod liver oil were not hydrolyzed by the fish muscle enzyme.

3.64 THE EFFECTS OF DEHYDRATION AND SUBSEQUENT STORAGE ON THE VITAMINS OF THE B COMPLEX IN COD

Scott, Jean and Rolfe, E. J. (Ministry of Agriculture, Fisheries and Food Experimental Factory, Aberdeen, Scotland)
Chemistry and Industry No. 19, 583-584 (May 9, 1959)

According to the author freeze drying is a comparatively mild treatment for the processing of fish; little loss of vitamin activity would be expected although subsequent prolonged storage may have a deleterious effect. The initial levels of riboflavin, nicotinic acid, pantothenic acid and vitamin B_{12} in cod were determined, previous workers having reported considerable variations due in part, perhaps, to sampling errors. Vitamin concentrations were found to increase towards the tail of the fish owing to the higher proportion of brown subcutaneous muscle tissue in this region. The brown tissue contained approximately three times as much riboflavin, pantothenic acid and vitamin B_{12} as the white tissue, although nicotinic acid contents were similar for the two tissues.

In sampling for the estimation of processing and storage losses attempts were made to use tissue with the same proportion of brown to white muscle. Freeze drying of raw skinned fillets had no effect on the riboflavin, nicotinic acid and vitamin B_{12} levels but an appreciable loss of pantothenic acid was usually noted. The product (4.5 to 5.5 percent moisture) was stored in nitrogen in cans at -20° (controls), 18° and 37° C. for up to 2 years, samples being removed at regular intervals for assay. All four vitamins were found to be extremely stable: the shelf life of cod under the same conditions was approximately 3 months at 37° C., but even after 2 years at this temperature (when the material was practically inedible because of off-flavor development, marked discoloration and retarded reconstitution) the riboflavin, pantothenic acid and vitamin B_{12} contents were found to be unchanged, but up to 25 percent loss of nicotinic acid was observed under the same conditions.

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6.193 THE USE OF CONDENSED HERRING SOLUBLES IN TURKEY POULT RATIONS

March, B. E. and Biely, Jacob (University of British Columbia, Vancouver, B. C.); Tarr, H. L. A. and MacLeod, R. A. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Progress Reports of the Pacific Coast Stations, Fisheries Research Board of Canada, No. 113, 3-5 (September 1959)

Introduction. --Condensed herring solubles contain high levels of the B vitamins including vitamin B_{12}; however, herring solubles is included in animal feeds primarily for its unidentified factor(s). Condensed herring solubles may therefore reduce the need for products commonly employed as vitamin B-complex supplements.

Purpose. -- The following experiments were conducted to determine if condensed herring solubles is as effective as dried brewers yeast for supplying supplemental B-complex vitamins in turkey poult rations.

Experimental. -- Three different basal diets were used. Basal diet 1 contained primarily soybean-oil meal, ground wheat, ground corn, and herring meal. Basal diet 2 contained primarily soybean-oil meal and ground feed screenings. Basal diet 3 contained primarily soybean-oil meal and ground corn. Riboflavin, niacin, calcium pantothenate, and alpha tocopheryl acetate were added in purified form to the basal diets used in this study to eliminate these vitamins as possible factors involved in any response to the two products being compared. Vitamin B_{12} was added to basal diets 2 and 3 but not to the basal diet 1, which contained 10 percent herring meal.

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 ABSTRACTER: Martin Heerdt

6.15 IDENTITY OF THE GEL FACTOR IN HERRING SOLUBLES AND MEANS OF OVERCOMING ITS EFFECT

McBride, J. R.; MacLeod, Robert A.; and Idler, D. R. (Fishery Technological Station, Vancouver, Canada)
Journal of Agricultural and Food Chemistry 7, 646-650 (September 1959)

Herring solubles is a fluid concentrate of herring stickwater, which is the water phase of the press juice obtained when whole herring are made into fish meal. To prepare solubles, suspended proteins must be either removed or destroyed. This may be accomplished either by acidulation, in which the proteins are coagulated and removed by centrifugation, or by enzyme digestion.

Acidulation has been used exclusively in British Columbia for many years. Experience has shown that even though the same process is applied to the stickwater throughout the year, the physical properties of the resulting solubles vary with the season. The solubles prepared from summer herring is fluid, whereas solubles prepared from fall and winter herring is viscous and tends to gel upon standing.

The purpose of the study reported here was to investigate the reasons for the differences in the viscosity of herring solubles and to determine how a uniform product can be produced throughout the year.

Procedure. -- To establish the degree of change in the properties of solubles prepared at different seasons of the year, solubles were produced at monthly intervals in the pilot plant using the acidulation process. Viscosity determinations, using both the Stormer and pour residue tests, were

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 ABSTRACTER: Kathryn L. Osterhaug

6.193 UNIDENTIFIED CHICK GROWTH FACTORS

Wakelam, J. A. (National Chemical Products Limited, London, W. 1)
Nature 184, 272 (July 25, 1959)

Introduction. --This study makes use of a tentative microbiological assay method for certain unidentified chick growth factors. The method is based on the growth stimulating effect of the factors on a strain of lactobacillus isolated from chicks receiving distillers dried solubles in their diet. This method is based on the hypothesis that the growth factors act by modifying the microbial flora of the chick's gut.

Materials. --Among materials assayed by the tentative method were fish meal, dried unextracted brewers yeast, dried whey, and molasses-distillers dried solubles. The latter material is obtained from the liquid remaining in the still after the distillation of ethyl alcohol produced by the yeast fermentation of molasses. Of these four materials, only fish meal failed to elicit a marked response from the lactobacilli.

Experimental. --Using the purified diet that is detailed elsewhere, the author endeavored to confirm these findings with chicks. Eight diets, as shown in the table (see over), were used in an effort to demonstrate whether or not such growth factors as may be present in the various additives were the same. The chicks were housed in two electrically heated, thermostatically controlled brooders with one replicate of each diet in each brooder. Each replicate consisted of 25 Rhode Island Light Sussex cockerels. The birds went into the units 1 day after hatching.

Results. --The results obtained are tabulated (see over). No significant differences appeared between diets 2, 3, 4, and the corresponding double additive diets 6, 7, 8, except that at 4 weeks the mean weight increase on diet 6 was significantly higher at the 5-percent level than on diet 2.

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 ABSTRACTER: Martin Heerdt

STORAGE OF DEHYDRATED COD

HERRING STICKWATER VISCOSITY

HERRING SOLUBLES FOR POULTS

UNIDENTIFIED CHICK GROWTH FACTORS

6.15

carried out on each sample. The results show clearly the increased viscosity and gelling in the solubles from herring caught in the winter.

The progressive increase in gel formation in solubles as the season progressed from summer to winter appeared to parallel the development of the gonads in the herring. The removal of the gonads did not reduce the viscosity of the solubles.

The gelatin content also was found to vary with the season, and changes in viscosity could be correlated to the variations in gelatin content of the solubles. The gelatin could be digested and the viscosity of the solubles reduced by the use of proteolytic enzymes.

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Examination of the feed intake figures showed considerable variation. When the above results were adjusted to a common feed intake by the use of regression coefficients, the growth response to fish meal disappeared but the other responses remained, although at a lower level. Under the above conditions, fish meal apparently acts only as a source of known nutrients and as an appetite-stimulating factor. On the other hand, responses were obtained with dried yeast, dried whey, and molasses-distillers dried solubles that evidently are due to an unidentified growth factor common to them all. With chick growth trials and the direct examination of gut flora, other workers have established that malt-distillers solubles and molasses-distillers solubles are directly equivalent in terms of unidentified growth-factor activity.

Diet	Mean weight increases (gm.)				
	Week 1	Week 2	Week 3	Week 4	Week 4 adjusted
1. Control	41.8	115.6	229.4	372.8	383.5
2. Control + 5% fish meal	47.2	125.3	256.0‡	395.2	392.5
3. Control + 2½% dried whey	51.6	136.0‡	262.2†	414.8*	418.8†
4. Control + 2½% dried yeast	50.8	135.8‡	266.8†	421.8*	425.4†
5. Control + 2% molasses distillers dried solubles (ethyl conc.)	53.7‡	137.6‡	271.4†	432.2*	420.9†
6. Control + 2½% E.C. + 5% fish meal	48.0	134.2‡	260.6†	421.3*	421.4†
7. Control + 2½% E.C. + 2½% dried whey	51.4	135.2‡	265.4†	430.8*	424.9†
8. Control + 2½% E.C. + 2½% dried yeast	55.0	145.1†	272.8†	433.6*	426.0‡
Standard error of mean weight increases	4.2	6.5	6.8	8.2	

Differences from control significant at 0.1%*, at 1%†, and at 5%‡ probability levels.

3.64 (Cross Reference: 8.64)

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In Experiment 1, condensed herring solubles and dried brewers yeast were compared as supplements to basal diet 1 at levels of 1.5 and 3.0 percent of the diet. Each dietary treatment was imposed on 20 male and 20 female Broad Breasted Bronze poults from 0 to 6 weeks of age.

In Experiment 2, condensed herring solubles and dried brewers yeast were compared as supplements to basal diets 2 and 3 at a level of 3 percent of the diet. Triplicate lots of 13 to 14 Beltsville Small White poults of mixed sexes were fed each of the diets until they were 5 weeks of age.

In Experiment 3, condensed herring solubles and dried brewers yeast were compared as supplements to basal diets 2 and 3 at levels of 0 and 3 percent of the diet. Each diet was fed to 19 male and 19 female Broad Breasted Bronze poults for almost 9 weeks.

Results.--When the average weights of the poults were tabulated at the end of each experiment, the authors learned that condensed herring solubles stimulated growth to a greater extent than did dried brewers yeast. Although vitamin B_{12} was included in all of the diets fed in experiments 2 and 3, the poults that received 3 percent of condensed herring solubles probably required no additional B_{12}. The relatively low response that was obtained with dried brewers yeast cannot be attributed to differences in the carrying of known or unknown factors from the breeder stock. The fact that similar results were obtained in three different experiments and that the poults were from different breeder flocks in each instance substantiates the low response to dried brewers yeast.

Conclusions.--With the type of practical turkey-starting diet used, condensed herring solubles is an effective supplement. Poults from three different sources showed a better response to condensed herring solubles than to dried brewers yeast. The difference between the response to condensed herring solubles and to dried brewers yeast occurred with a diet containing herring meal and with diets containing no herring meal but supplemented with vitamin B_{12}. Additional experiments are planned to determine if other natural sources of B-complex vitamins and unidentified factor(s) are warranted as supplements in the diets of turkey poults.

6.190 SUMMARY REPORT SYMPOSIUM FOR NUTRITIONISTS, MARCH 18, 1959

Anonymous
Technological Leaflet No. 20, 19 pp. (1959) (Bureau of Commercial Fisheries, U. S. Department of the Interior, Washington 25, D. C.)

Information on the biological value of fish meal using practical chick-type rations was presented. Data were reported on the following topics:

1. The effect of processing variables on the feeding value of fish meals.
2. The additive effect of fish meal and fish solubles on chick growth.
3. Practical feeding levels of fish meal and fish solubles.
4. The effect of amino acid balance upon dietary protein level.
5. The value of fish meal fed to chicks in floor pens versus battery brooders.

The following summary was presented:

Rather extensive research with chicks fed commercially practical broiler diets in batteries has failed to indicate at this time that commercial variables in processing will affect the uniform value of fish products.

When condensed menhaden fish solubles were superimposed upon menhaden fish meal in experimental treatments, their chick growth-promoting effect was additive.

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 ABSTRACTER: T. D. Runnels

6.195 NUTRITIONAL VALUE OF FISH MEAL PROTEINS AND THEIR RELATION TO PROCESSING VARIABLES

Grau, C. R.; Karrick, Neva L.; Lundholm, B. D.; and Barnes, R. N.
Commercial Fisheries Review 21, 7-12 (August 1959)

More than 100 batches of fish meal were studied. Each was used as the sole source of protein in the diets of chicks. The purpose of the investigation was to discover which of the processing variables, if any, affect the protein value of fish meal.

Procedure.--The general approach to the problem was to study meals produced from one species of fish during one year, note processing variables of possible significance, determine composition of meals, estimate protein quality of the meals by measurement of the growth of chicks, and then study the data to see if there was correlation between the processing variables and quality.

The data taken included the following: date of capture of fish, condition of raw material, method of drying the press cake, type of meal produced, when sample was taken, and proximate composition of the meal. The effects of time and temperature of storage on the nutritive value of the meals also were studied.

Most of the samples of fish meal used were from commercial sources, but a few were produced experimentally. The meals were made from whole menhaden, haddock fillet waste, and rosefish fillet waste.

The chick-growth method used to determine the quality of the protein in fish meals was as follows: Newly hatched white leghorn chicks were fed a commercial starter mash for 11 days, and then the heaviest and lightest birds were discarded. The remaining chicks were divided at random

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 ABSTRACTER: Kathryn L. Osterhaug

6.195 BIOLOGICAL AVAILABILITY OF AMINO ACIDS IN FISH MEALS AND OTHER PROTEIN SOURCES

Ousterhout, L. E.; Grau, C. R.; and Lundholm, B. D. (University of California and Bureau of Commercial Fisheries, Davis, California)
Journal of Nutrition 69, 65-73 (September 1959)

Introduction.--Comparatively little is known about the variation in the availability of each of the amino acids in protein, or how processing may affect their availability.

Experimental.--In this study, seven commercial fish meals, one deliberately scorched fish meal, five vegetable protein meals, one meat and bone meal, raw soy flakes, isolated soy protein, dried cottage cheese, casein, and dried brewers yeast were evaluated biologically by comparing the growth rates of young chicks maintained on diets 1, 2, and 3: Diet 1 contained the test protein as the only source of the amino acid being estimated and all of the essential amino acids except the one being estimated at levels exceeding the requirements of the chick. Diet 2, or the negative control, contained all of the essential amino acids except the one being estimated. Diet 3, or the positive control, contained a source of protein, usually the test protein, and all of the essential amino acids at levels exceeding the requirements of the chick. The method depends upon obtaining essentially normal growth when the test protein and a complete amino acid mixture are fed and on a knowledge of the approximate requirement for each essential amino acid. The growth data from the three diets, when plotted on a growth-response curve, provide an estimate of the availability of a specific amino acid. For most of the essential amino acids, an approximate linear-growth response is found from the zero level to levels slightly lower than the requirement. Disadvantages of the method include the expense of the diets, the necessity for using an assumed value for the requirement, and the possibility of confusing interactions between amino acids and other materials present in the test feed.

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 ABSTRACTER: Martin Heerdt

6.35 SEAWEED CHEMICAL BALKS ULCERS

Anonymous
Chemical and Engineering News 37, 37-38 (September 21, 1959)

Introduction.--A new drug has been added to the battle against ulcers. It is carrageenin, an ulcer-preventing, sulfated polysaccharide found in seaweed. Carrageenin inhibits pepsin, one of the enzymes found in the stomach. Its ability to prevent ulcers lends more support to the theory that pepsin--not acid--may be the chief villain in ulcers. The discovery of carrageenin's ulcer-blocking ability was the result of enzymologist Houck's studies of the kinetics and thermodynamics of the enzyme pepsin.

In his search for pepsin inhibitors, Dr. Houck tested a number of acid polysaccharides obtained from seaweed and found several that showed pepsin-inhibiting ability. One of these was carrageenin, which was nearly as active as heparin. The other was chondroitin sulfate.

Protection for animals.--Since pepsin is involved in the development of stomach ulcers, the possibility of preventing ulcers through pepsin inhibitors was studied. Heparin was found to be the best inhibitor of pepsin among the chemicals tested. Heparin, however, is an anticoagulant and therefore is definitely contraindicated for bleeding ulcers.

Ulcers were slightly inhibited in Shay-ligated rats that received 5 milligrams of carrageenin per milliliter of drinking water given by stomach tube. Better inhibition of ulcers resulted when 30 milligram capsules of carrageenin were implanted in the stomach of the rat. Almost complete inhibition of ulcers resulted from the addition of 5 milligrams of carrageenin per milliliter of drinking water offered to the rats. Control rats in contrast, showed an average of 16 ulcers per stomach and 45 percent of them died.

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 ABSTRACTER: Martin Heerdt

FISH MEAL AND SOLUBLES FOR CHICKS

AVAILABILITY OF AMINO ACIDS

PROCESSING FISH MEAL

CARRAGEENIN FOR STOMACH ULCERS

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Chick management. -- Sexed White Leghorn chicks used in these trials were raised for 11 days in electrically heated battery brooders on a commercial-type chick-starter mash, after which they were segregated on a basis of weight and sex into groups of four individual chicks and placed in small cages in a room maintained at 85° F. After 1 or 2 additional days on the starter mash, the chicks were placed on the experimental diets. Feed and water were supplied ad libitum, the chicks were weighed daily during the 6-day trial and were given 12 hours of light per day.

When an essential amino acid was being studied, it was omitted from the mixture and replaced with L-glutamic acid. All amino acid sources were checked for possible toxic impurities, and some, notably leucine, were recrystallized before use. The various foods usually were fed at levels that would furnish 10 percent of crude protein in the diet. Sometimes a protein level of less than 10 percent was required to enable the analyst to stay within the assay range. When this was the case, sufficient L-glutamic acid was included to bring the total protein equivalent to about 25 percent. Vitamin and mineral mixtures were included in the diets.

Results. -- The ratio of available arginine to total arginine in the fish meals was found to vary more than the ratios of any of the other amino acids studied. One high-quality fish meal with a total of 5.7 percent arginine appeared to contain only 3.0 percent available arginine; yet it was an excellent source of all of the amino acids including lysine, tryptophan, and the sulfur-containing amino acids. This meal gave a 6.7 percent gain in weight per day. Scorched fish meal contained some available sulfur-containing amino acids; no available arginine but 3.8 percent total arginine; and some available lysine but the smallest amount of total lysine. One high-quality fish meal contained more available methionine and methionine plus cystine than did a lower quality of fish meal that had a larger total amount of these amino acids. Except in the meal severely damaged by heat, practically all of the tryptophan was available to the chick. At present, this method of analysis is not suitable for valine, leucine, or isoleucine.

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Rats that received carrageenin in drinking water 24 hours before dosing with massive amounts of cortisone, which is another method of producing ulcers, scored an index of one. Rats treated with atropine and antacids, a standard ulcer treatment, scored 14; whereas control rats scored 19.

Similar results were obtained with dogs injected with histamine in beeswax. Within 30 days after the injection, all of the control dogs had died of perforated ulcers, whereas all of the dogs allowed to drink water containing 5 milligrams of carrageenin per milliliter of water lived, and none developed ulcers.

Effect of carrageenin. -- Carrageenin does not affect the pH of the stomach or the intestines, and it allows optimum conditions for the digestion of food. Similarily, it does not affect the acid-base balance of the stomach as do many of the older alkaline ulcer treatments. Carrageenin competes with food in the inhibition of pepsin; however, pepsin has a higher affinity for food than it has for carrageenin, and it will preferentially digest the food. In addition, carrageenin is inexpensive, is not absorbed, and is not toxic.

Disadvantages of carrageenin. -- Carrageenin is only moderately soluble in water. This means that an ulcer patient would have to drink large quantities of water to obtain an effective amount. Carrageenin is effective only up to a pH of about 2.5. This means that it is effective at the pH of a normal stomach, which is at pH 2.2. However, if an ulcer patient doses with antacids, he would be working against good results with carrageenin.

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Five percent fish meal and 2.5 percent condensed fish solubles in combination were found to be a practical level of fish products for the study of their chick growth-promoting properties.

A 26 percent protein unsupplemented corn-soy-fat chick diet produced superior growth to a 22 percent unsupplemented diet equated for energy. When these diets were supplemented with a combination of 5 percent fish meal and 2.5 percent fish solubles, the results from both diets were improved, but the lower protein diet was improved to a greater extent making the two different protein levels comparable. This is attributed to improved amino acid balance.

Preliminary findings indicate that results from battery experiments with fish products may not be applicable to floor pen studies under commercial conditions.

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into groups of four birds each and fed diets in which the fish meal under test provided all of the amino acids eaten by the chicks.

The possible adverse effects of storage on protein quality were studied directly by taking a series of meals that had been stored at 0° F. from the time of manufacture in June 1955 until June 1956, when the samples were divided. One-half of each sample was stored at 0° F.; and the second half, at a temperature of 85° F. Four of these paired fish-meal samples were fed after 2 months; the others, after 7 months of storage. The growth results show that although some of the meals deteriorated at the elevated temperature, others either were not changed in value or, even after having deteriorated, contained protein of higher quality than the diet required. More critical tests are needed to establish the nature of the observed effect.

Conclusions. -- A correlation was shown to exist between increased drying temperature and decreased protein quality as measured by the growth rate of chicks fed these meals. Other factors must also be important, however, because some meals that were dried at the higher temperatures were of good quality.

Some degree of correlation also was noted between the growth rate of the chicks and the composition of the meal as measured by its moisture-plus-oil content.

There also appears to be a correlation between protein quality and the duration and temperature at which the meal was stored after manufacture.

These correlations must be confirmed by additional work before they can be considered as being definitely established.

4.5 CARBONYLS IN OXIDIZING FAT. I. SEPARATION OF STEAM VOLATILE MONOCARBONYLS INTO CLASSES

Gaddis, A. M.; Ellis, Rex; and Currie, George T. (United States Department of Agriculture, Beltsville, Maryland)
Food Research 24, 283-297 (May-June 1959)

Introduction.--Carbonyl compounds influence the flavor and quality of many foods and natural products. They are believed to be largely responsible for the rancid flavors developed in oxidizing fat and fatty tissue. However, relatively little is known concerning the influence of composition, treatments, and conditions on the kinds and amounts of carbonyls formed in fat, and their relationship to odor and flavor. The objectives of this work were to determine some of the changes occurring in fractions of the steam volatile carbonyls of freezer-stored pork fat.

Methods are described for the estimation in fat of total steam volatile carbonyls, and mono- and dicarbonyl fractions thereof, as 2,4-dinitro-phenylhydrazone (DNPH) derivatives. The application of a new paper chromatographic method to the separation and determination of classes of monocarbonyl DNPH's is described. Classes of monocarbonyls changed progressively during oxidation with respect to those present and the proportions thereof. Heating oxidized fat at 165° C. also produced great changes in the classes of monocarbonyls. Types of monocarbonyls found were saturated aldehydes, minor amounts of the two lowest molecular weight saturated methyl ketones, a mixed group which contained as a major constituent a DNPH derivative of unknown class, 2-en-1-als, and 2,4-dien-1-als. In general, with oxidation, the proportion of saturated carbonyls increased in unheated fat, and unsaturated carbonyls (particularly 2,4-dienals) increased when the fat was heated. Resolution of the classes by paper chromatography indicated the probable presence in the saturated aldehyde class of (1) hexanal, propanal, ethanal, and methanol and (2) at least two C_7-C_9 saturated aldehydes, acetone, methyl ethyl ketone, three carbonyls of unknown class, five 2-en-1-als, and

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6.37 FOOD--SPACE AGE PROBLEM

Anonymous
Journal of Agricultural and Food Chemistry 7, 600-604 (September 1959)

The era of manned space flights is coming steadily closer. Hidden behind the headlines, however, is the problem of how to feed the astronaut. The answer to this question may determine how far the future astronaut will be able to venture. This problem has received little publicity compared to the problems of rocketry, thrust, and weightlessness. One nutrition expert frankly admits that the engineering problems concerned with space flight are far more nearly solved than the biological problems of the astronaut.

Basically, two solutions are possible. One, the man can carry food with him; or two, he can produce it along the way. Probably the only feasible way to accomplish the second alternative is with a closed ecological system.

Algae on the menu.-- In space flight there is one outstanding critical factor--permissible payload. One pound of freight is estimated to require 1,000 pounds of thrust.

Man's minimum water requirement is about 5 pounds per day; his oxygen need is about 2 pounds. He also eats from 0.8 to 1.7 pounds of food solids per day. Since a round trip to Mars would last for a period of years, it is easy to see why all the food cannot be packed.

In a closed ecological system--a balance between man and a photosynthetic plant--the plant should provide (1) gas exchange between itself and the space man, (2) means of consuming human wastes, and (3) food. The leading contender for this job is algae.

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ABSTRACTER: Kathryn L. Osterhaug

6.38 BACKGROUND INFORMATION FOR VOLUNTARY GRADE STANDARDS ON NATURAL SPONGES

Bennett, Robert B. (Department of Chemical Engineering, University of Florida, Gainesville)
Special Scientific Report: Fisheries No. 273, 60 pp. (May 1958) (Bureau of Commercial Fisheries, Fish and Wildlife Service, U. S. Department of the Interior, Washington 25, D. C.)

In a report on file at the University of Florida and at the U. S. Bureau of Commercial Fisheries, the following objectives were achieved: (1) to assemble information from which a voluntary Federal standard of grade and condition of sponges could be developed by the Bureau of Commercial Fisheries when the need for it had been demonstrated; (2) to prepare a report on current industrial practices in the classification of sponges, supplementing sensory tests by developed quantitative tests wherever possible; and (3) to recommend a sound system of grading based on the above information, giving ranges and evaluation weights. This present report is an abridgment of the original report.

A census taken at St. Petersburg, Florida, indicated (1) that the user of sponges is interested in several properties present in natural sponges but not present in synthetic ones and (2) that wearability and ability to hold and release water are of primary importance. The quantitative tests given in the present report appear to have possibilities of satisfactorily measuring these properties.

Important sponges described are Inshore and Rock Island, Bengasi Mediterranean and Deepwater Mediterranean, Florida Key Wool or Sheepswool, Cuban Sea Wool, Florida Yellow, and Anclote Grass and Hudson Grass.

A demerit system of grading is proposed, which usually proceeds as follows for the individual, thoroughly wet and squeezed sponge:

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ABSTRACTER: June H. Olden

6.72 PHYSICAL AND CHEMICAL PROPERTIES OF PROTAMINE FROM THE SPERM OF SALMON (ONCORHYNCHUS TSCHAWYTSCHA)

Carroll, William R.; Callanon, M. Joan; and Saroff, H. A. (United States Public Health Service, Bethesda, Maryland)
Journal of Biological Chemistry 234, 2314-2316 (September 1959)

Purpose.--This paper presents (1) the results of a direct determination of the anion-binding characteristics of salmine and (2) a scheme to account for the fact that out of 18 to 19 positive groups only six binding sites with a high affinity for anions are available. The remaining groups have a much lower affinity for anions.

Experimental.--Salmine used in these studies was purified as salmine sulfate by the cold precipitation procedure. Salmine chloride was prepared by passing a water solution of the sulfate through an IRA-400 column in the chloride form. Salmine thiocyanate was prepared by treating the salmine sulfate with an equivalent amount of $Ba(SCN)_2$, removing the precipitated $BaSO_4$, and passing the remaining solution through the IRA-400 column in the thiocyanate cycle. Salmine concentrations assayed on the basis of dry weight, Kjeldahl nitrogen, or the refractometric method of Svensson and Odengrim (1952) ranged from 0.0758×10^{-3} to 7.28×10^{-3} M (0.036 to 3.77 percent); total anion concentrations ranged from 0.0041 to 0.24 M.

Binding of the anions was measured in a cell constructed from two lucite blocks and equipped with a semipermeable collodion membrane made selective to anions by the incorporation of polyvinyl-n-methylpyridine. Potentials were measured with a vibrating reed electrometer connected to a Brown Recorder. A series of measurements was made on successive dilutions of the salmine salt, and also with known quantities of neutral salt added to the salmine solution.

Results.--Over a wide range of total anion concentration, the number of anions bound was about six per molecule of salmine; this was true both for mono- and divalent anions. Assuming that these

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ABSTRACTER: Martin Heerdt

CARBONYLS IN OXIDIZING FAT

ALGAE FOR ASTRONAUTS

STANDARDS FOR NATURAL SPONGES

PROTAMINE FROM SALMON SPERM

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Jack Myers, University of Texas botanist and zoologist, has found that from 5 pounds to as low as 2.5 pounds of the common alga, Chorella pyrenoidosa, can absorb the CO_2 exhaled by one person and, in turn, produce enough oxygen to sustain one person. It can also supply his food needs with some supplemental help. Algae must, however, be kept in water to function properly, so the weight of the system is from 10 to 100 times the weight of the algae alone.

Algae multiply faster than higher plants, but even most algae are not fast enough. Researchers are hunting for strains that will fill all requirements.

Algae are potentially a nourishing food. They contain approximately 50 percent protein, 15 percent carbohydrate, 25 percent fat, and 10 percent ash. Some B vitamins, carotene, and ascorbic acid also are present.

Algae require the same nutrients to flourish as do the higher plants--nitrogen, phosphorus, potassium, and carbon, as well as some trace elements. Human waste products contain most of the needed elements. A practical means of disposing of waste thus is available.

Although using algae in a closed ecological system is theoretically possible, many engineering problems remain to be solved. Algae need illumination, they must be aerated, and their population density must be controlled. Scientists must find a way to harvest them and transmute them into a form acceptable as food. They also must design a miniature processing plant to handle human wastes.

There are two objections to the use of algae as food for spacemen. The first concerns the one-food diet aspect, the other concerns the aesthetic values of algae--flavor, odor, and texture.

Lack of variety is a big drawback. This factor becomes very important in long space flights because food will be man's chief link to the world as he knows it.

Most estimates are that a closed ecological system will not be practical for another 5 or 10 years. Most people agree, however, that it won't be needed for 10 years because other food forms will satisfy the needs of short flights into space.

When it does come, the product of the closed ecological system probably will not be the astronaut's sole source of food but will provide a supplement to his diet.

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six sites constitute a set, an evaluation of the apparent intrinsic association constant for the binding of anions to this set can be made from the experimental data by the use of equation (1), below.

$$(1)\ \bar{\nu}_A = \frac{k'_{Ac_A} n}{1 + k'_{Ac_A} + \frac{1}{k'_{Hc_H}}} \qquad (2)\ \bar{\nu} = \frac{k'_{Ac_A} n}{1 + k'_{Ac_A}}$$

In (1) $\bar{\nu}_A$ is the average number of anions per mole bound to a maximum of n sites in the set with the apparent intrinsic association constants k'_A and k'_H for the anion and hydrogen ion respectively, at the concentration c_A and c_H of the free anion and hydrogen ion, respectively. Since the measurements were made at a pH at which all of the guanidine groups of arginine were in the form of the positive quanidinium ion, the term $1/k'_{Hc_H}$ may be ignored and equation (1) may be reduced to the form of equation (2) above.

Data were calculated from equation (2) with $k'_A = 3600$ and $n = 6$; and a curve was plotted from this data. The concentrations of chloride ion and thiocyanate ion were corrected with the values of the activity coefficients given in Harned and Owen (1958). Thus, the apparent association constant value for the chloride and thiocyanate ions was a minimum of 3600. The constant for the sulfate ion is larger than that for the chloride and thiocyanate ion, but it cannot be evaluated more precisely from the data. However, the value $n = 6$ for the first set of sites is the same for all three anions.

With such very large association constants, the binding was effectively the same on a molar basis for all of the anions studied. This results in a set charge of +12 for the salmine cation when monovalent anions are used, but only +6 when divalent sulfate is the counter ion. With 18 to 19 arginine residues per 4070 gm. of salmine, the authors hoped that the sulfate ion and thiocyanate ion data would permit the evaluation of the constants for the next 12 to 13 potential binding sites. The solubility of the salmine salts as well as the precision of measurement, however, limited the range of data at higher free anion concentrations.

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three 2,4-dien-1-als, or a total of at least 19 monocarbonyls. The dicarbonyl fraction appeared to be composed principally of a-dicarbonyls, but there was evidence of the presence of other types of dicarbonyls.

The methods described are adapted to the determination of the kind and proportions of carbonyl classes formed in small amounts of fat as the result of conditions to which the fat or fatty tissues have been exposed. Application of these methods may shed light on the mechanism of rancidity development from the standpoint of peroxide-carbonyl relationships, the well-known sensitivity of taste, and the classes of carbonyls present. The potential value of the procedures in the identification and determination of individual carbonyls is indicated.

Forty-eight references are cited.

6.38

1. Check for trueness to type, rejecting any lot containing sponges not true to type as being impossible to grade.
2. Check for size according to a mutually accepted standard method.
3. Look for faults: (a) smell for strong odor; (b) squeeze out a few drops of water to detect gurry; (c) run thumbs from top of sponge down sides, looking for holes and other faults; (d) inspect the bottom for dirt, holes, and looseness; (e) squeeze to detect interior dirt, such as shells and rocks; (f) squeeze to detect elasticity, stiffness, poor recovery of shape, or weak inside structure; (g) inspect surface structure and shape; (h) test for brittleness and tendency to split; and (i) run special tests for a particular type or use.
4. Assign demerits to the sponge according to the agreed standard system of demerits.
5. Determine the grade of the sponges in the lot by considering the average number of demerits assigned to the sponges in the given lot.

Faults are divided into two groups: major, requiring a maximum of 200 to 300 demerits, and minor, requiring a maximum of 50 to 150 demerits. Major and minor faults, in turn, are divided into two subgroups: workmanship, controllable by seller, and character, controllable only by selection and grading.

Four quantitative tests are discussed: water test, abrasion test, cleanliness test, and density test.

The following water properties of sponges were quantitatively determined: water-holding power, squeezed wetness, cleanability, stiffness, elasticity, and shape recovery. A summary of water properties does not reveal any one outstanding type of natural sponge, but these quantitative tests should enable a buyer to pick the type of sponge he needs for a particular property.

It is reported that more work is needed to correlate the abrasion test with types and grades of sponges. This test cannot presently be used to predict the wear of sponges in actual service.

It is felt that no natural sponge should contain more than 10 percent of material that can be removed by thorough washing. In most cases, a qualitative test may have to be used. The best tests for density indicated that the basic material of the sponges had a density of 1.50 grams per cubic centimeter of sponge material. The author recommends dimensions rather than weight as a basis for the sale of sponges. Recommendations for grading standards by members of the Sponge Exchange at Tarpon Springs, Florida, are presented.

6.32 ON THE PRESENCE OF 1–6 LINKAGES IN LAMINARIN

Smith, F. and Unrau, A. M. (University of Minnesota, St. Paul)
Chemistry and Industry No. 27, 881 (July 4, 1959)

Early methylation studies indicated that the linkages in laminarin were largely of the 1–3 β type. Subsequently, graded hydrolysis was shown to give gentiobiose and oligosaccharides containing the gentiobiose residue, thus demonstrating the presence of 1–6 linkages. Later investigations revealed that laminarin consisted of two components, laminaritol and laminarose; this observation, coupled with the more recent finding that D-mannose residues are present in both laminaritol and liminarose, have necessitated the re-examination of both of these components of laminarin.

Purpose.--This communication is concerned with structural studies of laminarin, using a new method involving periodate oxidation, reduction ($NaBH_4$) and hydrolysis (0.1N H_2SO_4 at 25° C.), which support the view that 1–6 linkages are present in laminaritol and in laminarose.

When the non-reducing component of laminarin, laminaritol (I), was treated in the above manner, oligosaccharide glycosides of glycerol (II and III) and glycerol were formed. After separating the glycerol, the oligosaccharide fragments (II and III), which were shown to give rise to glycerol and reducing sugars upon complete hydrolysis (N H_2SO_4, reflux), were subjected to periodate oxidation, reduction and mild acid hydrolysis as before. Again, glycerol was generated from the terminal non-reducing units in the mild hydrolysis step at 25° C., but no ethylene glycol was detected. However, when the reaction products (IV and V) were completely hydrolyzed (N H_2SO_4, reflux), ethylene glycol (from IV), glycerol (from V) and reducing sugars (from IV and V) were liberated. The ethylene glycol was separated chromatographically and identified as its di-p-nitrobenzoate, m.p. and mixed m.p. 142°. It is believed that the ethylene glycol arises from 1–6 linked D-glucopyranose units

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8.59 ORANGE-RED FLESH IN COD AND HADDOCK

Bligh, E. G. and Dyer, W. J. (Fisheries Research Board of Canada, Technological Station, Halifax, Nova Scotia)
Journal of the Fisheries Research Board of Canada 16, 449-452 (August 1959)

Introduction.--During recent years, four or five cod (Gadus callarias) with pigmented flesh have been examined in the authors' laboratory. In June 1958, the authors received a 25-inch long pigmented cod that had been caught at the entrance to Halifax Harbor. The head, fins, lining of the visceral cavity, and the muscle tissue of this cod had pronounced orange-red pigmentation. The moisture and lipid contents of the flesh were 82 and 0.8 percent, respectively, which is normal. Analytical data on the pigments of fish flesh have been based on absorption spectra only in the past; therefore, to obtain more detailed information, the authors decided to make a chromatographic separation of the pigments.

Experimental.--The absorption spectrum of an acetone extract of the muscle tissue of this cod agreed with those of similar extracts prepared by Baalsrud (1956) and by Templeman and Sandeman (1958) and indicated the presence of astaxanthin. When (1) a portion of the acetone extract was evaporated to dryness under nitrogen and (2) the pigments were partitioned between petroleum ether and 90 percent volume-for-volume of aqueous methanol, almost all of the orange-red color appeared in the methanol layer. This indicated that the astaxanthin was primarily present in the unesterified form in contrast to Baalsrud's finding.

Chromatographic separation of the pigments was carried out as described by Goodwin and Srisukh (1949). The pigments, in petroleum ether, were applied to the top of a column of weakened alumina. Elution with petroleum ether removed only a trace of yellow color. Subsequent elution with 95 percent ethanol removed an orange band (pigment I). The bulk of the pigment on the column

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ABSTRACTER: Martin Heerdt

7.53 A RAPID METHOD OF TOTAL LIPID EXTRACTION AND PURIFICATION

Bligh, E. G. and Dyer, W. J. (Technological Station, Halifax, Nova Scotia)
Canadian Journal of Biochemistry and Physiology 37, 911-917 (August 1959)

Purpose.-- The present paper describes a method whereby the lipids of biological materials can be extracted and purified with mixtures of chloroform and methanol in a single operation.

Theory.--According to the chloroform-methanol-water-phase diagram, optimum lipid extraction should result when the tissue is homogenized with a mixture of chloroform and methanol. These solvents, when mixed with the water in the tissue, will yield a monophasic solution. The resulting homogenate can be diluted with water, chloroform, or both to produce a biphasic system. The chloroform layer of this biphasic system will contain the lipids, and the methanol-water layer will contain the nonlipids. A purified lipid extract should therefore be obtained when the chloroform layer is separated from the methanol-water layer.

Lipid extraction and purification.--Tissues, such as cod muscle, that contain 80 ± 1 percent water and about 1 percent lipid are treated as follows: Homogenize a 100-gram (g.) sample of the fresh or frozen tissue in a Waring Blendor for 2 minutes with a mixture of 100 milliliters (ml.) of chloroform and 200 ml. of absolute methanol. To this mixture add 100 ml. of chloroform, blend for 30 seconds, add 100 ml. of distilled water, and blend for another 30 seconds. Filter the homogenate through Whatman No. 1 filter paper onto a Coors No. 3 Buchner funnel, and apply slight suction. When the residue on the filter paper becomes dry, use the bottom of a beaker to apply pressure to the residue to remove any remaining solvent. Transfer the filtrate to a 500-ml. graduated cylinder, and allow a few minutes for complete separation and clarification. Record the volume of the chloroform layer (at least 150 ml.), and remove the alcoholic layer by aspiration. The chloroform layer contains the purified lipid.

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ABSTRACTER: Martin Heerdt

8.59 BIOCHEMICAL STUDIES ON SOCKEYE SALMON DURING SPAWNING MIGRATION VI. RIBONUCLEIC ACID AND DEOXYRIBONUCLEIC ACID

Creelman, Vera M. and Tomlinson, Neil (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Journal of the Fisheries Research Board of Canada 16, 421-428 (August 1959)

Introduction.--The ribonucleic acid (RNA) and deoxyribonucleic acid (DNA) content of the various tissues of sockeye salmon (Oncorhynchus nerka) was determined at different stages of spawning migration as a part of an investigation on the biochemistry of migrating salmon (Idler and Tsuyuki, 1958; Idler and Bitners, 1958; Duncan and Tarr, 1958; Wood, 1958; Idler and Bitners, 1959).

Experimental.--The procedure by which samples were obtained has been described in detail by Idler and Tsuyuki (1958). The samples examined in the present work were from the 1957 Fraser River run to Stuart Lake. These samples were portions of the same pooled-samples that were used in the previously described work of Idler and Tsuyuki (1958).

RNA and DNA in the tissues were separated by a modification of the procedure of Schmidt and Thannhauser (1945). RNA was measured by a procedure based on that of Davidson and Smellie (1952). For determination of DNA phosphorus, suitable aliquots of the DNA fractions were digested with 1 milliliter of 70 percent perchloric acid. The volume of the digest was brought to 10 milliliters with distilled water, and phosphorus determinations were made on suitable aliquots by the method of King (1932).

Results.-- Preliminary work indicated that the results of determinations made on different groups of fish obtained at one station were in agreement with each other within ±6 percent. Analyses

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ABSTRACTER: Martin Heerdt

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Adaptation to other materials.--The above procedure can be applied directly to any 100-g. sample containing 80 g. of water. Many alterations of the procedure are permissible, but the volumes of chloroform, methanol, and water--before and after dilution--must be kept in the proportions 1:2:0:8 and 2:2:1:8, respectively. These ratios represent the total volumes present in the ternary systems, including the water present in the sample.

Determination of lipid content.--Evaporate a portion of the lipid extract containing 100 to 200 milligrams (mg.) of lipid to dryness in a tared flask, and determine the weight of the lipid residue. Evaporation, which is facilitated by a stream of nitrogen, is carried out in a water bath at 40° to 50° C., and the residue is dried over phosphoric anhydride in a vacuum desiccator. After weighing, add a small volume of chloroform to each flask to detect the presence of nonlipid or insoluble material. To obtain the total lipid content of the sample, multiply the weight of lipid in the aliquot by the volume of the chloroform layer, and divide the product by the volume of the aliquot.

Comparison with existing methods.--Various samples of well-mixed minced cod muscle (100 grams each) were extracted according to the above method and the methods of Dambergs (1956), Folch et al. (1951), and A.O.A.C. (1955). Sample one as extracted by the present method averaged 0.666 percent lipid (standard deviation, 0.013), which was higher than the values obtained by using the A.O.A.C. method. Sample two as extracted by the present method and the method of Folch et al. gave yields that were not significantly different except that the extract prepared by the method of Folch usually contained small amounts of nonlipid material. Samples (100 g.) of the flesh of several species of fish with different fat contents and samples (10 g.) of two lots of fish meal also were analyzed by the described method and that of Dambergs. The method described here usually extracted more lipid than did the method of Dambergs.

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were made, therefore, on the tissues from only one of the groups of fish of each sex taken from each of the three points along the route of migration. Owing to a limited quantity of tissues, the heart and spleen analyses were made for each sex on a sample obtained by combining 1-gram amounts from each of the four groups.

The results of the RNA determinations may be summed up as follows: During migration a marked loss occurred in total RNA in the alimentary tract tissue and in the flesh in both sexes. The greater part of the loss occurred during migration between Lummi Island and Lillooet. The concentration of RNA in these tissues also decreased.

The total RNA in the heart, kidney, liver, and spleen did not appear to change greatly during migration. A much greater concentration and total amount of RNA was found in the liver of the female than in that of the male. The quantity of RNA in the roe nearly doubled during migration, whereas the milt showed a decrease in total RNA. RNA increased during migration in the combined tissues from head, skin, bones, and tail.

The results of DNA determinations may be summarized as follows: For both sexes there was loss in total DNA in the alimentary tract. DNA in the alimentary tract, however, was lost more slowly than in the other tissues, which led to an apparent increase in DNA concentration in the alimentary tract. Total DNA increased in both milt and roe. The combined tissues from head, skin, bones, and tail also showed an increase in total DNA. The changes in quantity of DNA in the flesh, heart, kidney, liver, and spleen were relatively small and somewhat irregular.

In the whole fish of either sex, a net loss in RNA and a net gain in DNA occurred during migration. In males, the gain in DNA exceeded the loss in RNA; whereas in females, the gain in DNA was much smaller than the loss in RNA.

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according to the scheme indicated.

Laminaric acid obtained from laminarose, the reducing component of laminarin, likewise afforded ethylene glycol when subjected to the same reaction sequence applied to laminaritol. The amount of ethylene glycol, determined by the chromotropic acid method, indicated that laminaritol contained two 1→6 linkages whereas laminarose contained only one such linkage.

Whether the 1→6 linkages involve only D-glucose units remains to be ascertained and it is also necessary to establish whether any of the 1→6 linkages constitute branch points, as recently suggested in the chains of 1→3 linked hexose residues in which case they would not be detected by the above diagnostic procedure.

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(pigment II) was eluted with 2 percent volume-for-volume of glacial acetic acid in 95 percent ethanol. The behavior of pigment II is characteristic of astaxanthin. A pink band (pigment III) remaining at the top of the column was removed with 2.5 percent weight-for-volume of KOH in 95 percent ethanol. The behavior of pigment III is characteristic of astacin, which is formed from astaxanthin by oxidation. After the KOH-ethanol eluate had been neutralized with acetic acid, the three pigment-containing eluates were evaporated to dryness under nitrogen. Each of the three pigment residues was dissolved in a small volume of methanol, and the absorption spectrum of each was determined.

These findings and an inspection of the absorption spectra led to the conclusion that pigments II and III were, respectively, astaxanthin and astacin. Astacin, as such, has not been found in nature; and the astacin that was isolated from the extract probably originated from astaxanthin. Pigment I, initially, was believed to be esterified astaxanthin. However, the absorption spectrum of pigment I turned out to be practically identical to that of either β-carotene or zeaxanthin. When partitioned between petroleum ether and 90 percent methanol, pigment I accumulated in the methanol layer. This is a property of zeaxanthin that distinguishes it from β-carotene.

Kanemitsu and Aoe (1958) reported astaxanthin levels of about 3.3 and 0.5 milligram (mg.) percent in sockeye and spring salmon (Oncorhynchus nerka and O. tschawytscha), respectively. By utilizing (1) the extinction coefficient of Kanemitsu and Aoe for astaxanthin in acetone ($E^{1\%}_{1\,cm.}$ = 2,200, at 478 mμ) and (2) data obtained in this study, the authors estimated that the cod they were examining contained about 0.3 mg. pigment per 100 grams of flesh.

A haddock (Melanogrammus aeglefinus) with a flesh pigmentation of about one-tenth of that of the cod described above was included in this study. When the extracted pigments were subjected to chromatography, astaxanthin and astacin were not detected; and the coloration appeared to be caused entirely by zeaxanthin, and had an absorption spectrum identical to that of pigment I from the cod.

6.54 STABLE, ODORLESS, NEUTRAL FLAVOR FISH FLOUR

Anonymous
Food Processing 20, 79 (October 1959)

Research on the prevalence of protein malnutrition in many parts of the world has led to the development of a high protein, edible fish flour that is equivalent in biological value to animal muscle and milk. It keeps well and can be incorporated into local foods and dishes without much difficulty. It can be made to retain a fish flavor for those areas of the world where this makes the protein more acceptable, or it can be deodorized for consumption in those areas where a neutral taste is required.

In many instances, complete deodorization is not necessary. The primary aim in processing the raw fish is to prevent reversion of the fish flavor and to deodorize to the point that 10 percent of the flour will not be detectable when added to any food.

Development may have application as a protein fortifier in the United States.

Odorless fish fish flour with a neutral taste is now being manufactured for domestic consumption from fish fillets. It may find use in bread, pasta, cakes, and pastries. It can also be added to soups, gravies, sauces and other foodstuffs.

This domestic fish flour is 90 percent protein and is priced at less than milk protein lactalbumin to which it can be compared nutritionally. Comparisons of this fish flour with other protein sources are shown in table (see over).

High protein fish flour, which is perfectly stable and does not develop off-odors and taste in storage, will be priced at approximately 65 cents per pound in ton quantities.

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8.8 PROBLEMS AND TRENDS IN THE FISH INDUSTRY--II.

Cutting, C. L. (Humber Laboratory, D.S.I.R., Hull, England)
Food Manufacture 34, 305-311 (August 1, 1959)

Chilling and freezing.--Inadequate cooling of fish all along the distribution chain is responsible to a great extent for loss of quality and enhanced spoilage rates. After being unloaded from trawlers, fish are held, uniced, on the fish market for several hours waiting for sales to begin and then awaiting filleting. Since the fish are usually "washed" in a trough of about 50°F. water before they are filleted, the temperature of the fillets becomes approximately the same. Fillets in 2-stone boxes usually have ice spread on the top only; thorough admixture of ice is necessary for quick and efficient cooling.

Fish slime, harboring fish-spoilage bacteria, can be removed only by suitable detergents, disinfectants, and scrubbing. One or two fish-merchandizing firms now use detergents and chlorinated water for cleaning equipment, and they use mechanical jet fish-washers instead of the commonly used wooden filleting trough in which a heavy bacterial count can build up. Filleting and skinning machines, as an alternative to the hand-filleting board of uncoated wood, are becoming more widely adopted, thus avoiding one source of contamination. Nonreturnable wooden boxes are replacing returnables. An attempt is being made to develop a moulded pulp container with a high degree of wet strength that would be cheaper and stronger than the nonreturnable wooden box.

The essential technical problem of the British white fish industry is how to bring home distant-water fish in really fresh condition. If freezing is to be the solution, it will have to be carried out close to the fishing grounds.

A wholesale swing-over to factory trawlers of the Fairtry type, which catches and processes

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ABSTRACTER: June H. Olden

8.64 A COMPARATIVE STUDY OF VITAMINS IN THE TRUNK MUSCLES OF FISHES

Braekkan, Olaf R.
Reports on Technological Research Concerning Norwegian Fishing Industry (Fiskeridirectoratets Skrifter Serie Teknologiske Undersökelser) III., No. 8, 42 pp. (1959)

The properties and physiology of the red and white muscles of fish were reviewed by Needham (1926) and Hines (1927), who both pointed out that the white muscle is faster than the red muscle, but it becomes fatigued more easily. The animal muscle has two sources of energy: fermentation and oxidation. Respiratory enzymes are needed to maintain these metabolic processes. Vitamins act as cofactors in the form of coenzymes with the respiratory enzymes. Potter (1948) points out that the cofactor concentration may be decisive in determing enzyme activity, and if the factor is dissociable, the activity is proportional to the amount of cofactor or vitamin present within a limited range. If these assumptions are valid, a relation between the occurrence of vitamins in the muscles and their activity may be expected. A relationship also may be expected therefore between the occurrence of vitamins in the skeletal muscles and the activity of the fish.

The present study started out as an attempt to find such a correlation. In the course of the study, several B-vitamins were determined in both the ordinary and the red muscle of tunny. The results from analyses of the B-vitamins--niacin, riboflavin, pantothenic acid, vitamin B_{12}, and thiamine--revealed an interesting relative distribution. With the exception of niacin, the red muscle contained several times more of the B-vitamins than did the ordinary muscle.

Samples from the ordinary muscle as well as from the red lateral muscle of several teleosts were studied. The results focussed the attention on the red muscle of fishes in general. The liver of

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ABSTRACTER: Kathryn L. Osterhaug

8.8 CHEMICAL STUDIES ON THE HERRING (CLUPEA HARENGUS) I. TRIMETHYLAMINE OXIDE AND VOLATILE AMINES IN FRESH, SPOILING AND COOKED HERRING FLESH

Hughes, R. B. (Torry Research Station, Aberdeen, Scotland)
Journal of the Science of Food and Agriculture 10, 431-436 (August 1959)

Introduction.--The work described in this paper was designed to study factors that influence the flavor and odor of canned herring. Herring are characterized by a high fat content that varies seasonally from 18 to 25 percent during summer and may be reduced to less than 5 percent in winter. The water content varies inversely with the fat content, so that the third major component, the protein, remains constant throughout the year at about 19 percent of the flesh. Associated with these main components are minor components which may be fat- or water-soluble. The water-soluble components--the extractives--have been extensively studied in recent years, especially in white fish. These substances of low molecular weight probably make an important contribution to the odor and flavor of fish. Changes that may occur in the extractives and thus influence the acceptability of herring when they are canned are as follows: (a) changes that occur while the herring are still alive, that is, seasonal variations in fat and water; (b) post-mortem changes that begin to operate when the herring are dead and consist of immediate autolytic changes followed later by changes caused by bacterial action; (c) changes that occur during sterilization when the herring are heated at 120°C. for 1 hour in sealed cans; and (d) chemical changes that occur in the sterile pack during storage when flavor and odor alter markedly. Chemical changes that occur in (c) and (d) will be influenced by the addition of sauces or spices to the pack.

Purpose.--In the present paper, attention is confined to a study of trimethylamine oxide, volatile amines, and ammonia under some of the influences mentioned above.

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ABSTRACTER: Martin Heerdt

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some species of fish is very fat and has few blood vessels. This prevents a rapid restoration of the energy-giving metabolites from the liver to the bloodstream and muscles. This suggests the possibility that the red muscle in fish is an organ developed to meet the demand for energy. This paper therefore is concerned with the possible function of the red muscle of fish.

Two related investigations are presented: (1) the relation between the activity of different species of fish and the average vitamin content of the whole muscle and (2) the relation between the vitamin content of the red muscle and that of the ordinary muscle of fish. A theory concerning the possible function of the red muscle of fish is presented.

B-vitamins versus activity.--Fifteen species of fish were studied with regard to their relative contents of niacin, pantothenic acid, riboflavin, and vitamin B_{12} in the trunk muscles. A significant relationship seemed to exist between the content of these vitamins and the activity of these fishes.

Vitamins of ordinary versus red muscle.--In seven species, the relation between the contents of niacin, pantothenic acid, riboflavin, vitamin B_{12}, and thiamine in the red muscle and those in the ordinary muscle from the same fish was determined. The results demonstrated that with the exception of niacin, the vitamins were present in much higher concentration in the red muscle than they were in the ordinary muscle. The general distribution was very similar to conditions prevailing in the liver. In most fishes, the red muscle had a much higher fat content than did the ordinary muscle.

The author suggests that the red muscle functions mainly as a metabolic organ, in a manner similar to that of the liver. Further chemical, anatomical, and histological studies, however, are necessary to establish the proposed function of the red muscle.

8.8 (Cross Reference: 3.332)

Experimental.--Gas chromatography of amines, which offers a specific method for analyzing mixtures of volatile bases that are likely to be found in spoiling and in cooked fish flesh, was used in this study. The apparatus and method used have been described by James and Martin (1952) and James et al. (1952).

To obtain data on seasonal variations, the filleted flesh from herring was minced and a suitable weight, usually 10 grams, was extracted thoroughly with 10 percent trichloroacetic acid solution in a high-speed mixer. The resulting extract was made up to a volume of 200 or 250 milliliters (ml.) and filtered through a fine paper. For data on post-mortem spoilage, immature herring were held at 10° to 13° C. and sampled at intervals of 8 hours over a period of 4 days. Before extraction, the head was partially severed and then drawn away from the body to remove the gut also. The remainder of the herring was comminuted and thoroughly extracted with six, 60-milliliter portions of 10 percent trichloroacetic acid solution, and the resulting solution was made up to 500 ml. and filtered. To obtain data on cooked samples, herring flesh was cooked in sealed glass tubes immersed in a liquid-paraffin bath held at 120° C. When cool, the tubes were opened, and the flesh and exuded liquor were combined for analysis and extracted with 10 percent trichloroacetic acid.

Trimethylamine oxide was estimated by the method of Markham (1942).

Preparation of samples for gas chromatography.--Fifty ml. of the trichloroacetic acid extract was adjusted to pH 11 to 12 with NaOH and the amines were steam-distilled into 10 ml. of 0.1 normal HCl. After the volume was reduced to about 5 ml. by distillation under reduced pressure, the solution was dried in a centrifugal freeze-drier. The residue of amine hydrochlorides was dissolved in 0.3 ml. of water, and a suitable aliquot of this solution (10 to 50 μl.) was applied to the column with a micrometer syringe.

Results.--Fresh herring flesh contained ammonia and a small quantity of trimethylamine. Monomethylamine, dimethylamine, and higher amines in the range ethylamine to pentylamine were not detected. Trimethylamine oxide was higher in winter than in summer.

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The table, below, serves to compare the various available protein sources with fish flour. Numbers are used to assign estimated values to these protein sources for purposes of comparison. The number 1, for example, indicates the lowest value, while 10 indicates the highest value in the four categories of comparison.

Stability (without refrigeration) means the type of refrigeration found in the average home. From the table, it may be seen that while dried milk does have a certain amount of stability, as do dried and smoked fish, stability is not nearly as great as that of fish flour. Availability may be considered as the same type of comparison.

Regarding consumer acceptance, it is relatively safe to assume that the majority of consumers would eat all of the various foods listed. Fish flour, however, would have a higher consumer acceptance because it is introduced into products without detection. Therefore, it would be accepted by all consumers who eat any of the foods in which it is used.

Quantity of protein per unit cost simply means that while dried milk and dried and smoked fish provide good quality protein at less cost than those marked No. 1, the cost is still far greater than the cost of fish flour.

Comparison of fish flour with other protein sources

	Fresh egg	Dried egg	Meat	Fresh milk	Dried milk	Fresh fish	Dried and smoked fish	Fish flour
Stability (without refrigeration)	1	4	1	1	7	1	6	10
Availability	1	1	1	1	5	2	3	10
Consumer acceptance	10	10	10	10	10	10	10	10
Quantity of protein per unit cost	1	1	1	1	3	1	3	10

8.8

its own fish, would imply the obsolescence of the modern distant-water fleet of some 250 vessels. An investigation therefore has recently been made into the possibility of converting a distant-water trawler to freeze a proportion of its present catch. The experiment, which was made on the Northern Wave, was technically a success. The Northern Wave froze whole fish, which had to be thawed but could then be handled by the port fish trade in the normal way. The attitude of owners of distant-water trawlers is that the trade must accept the necessity for freezing, and ultimately for freezing at sea.

Smoking.--Only with a mechanical kiln for smoking is it possible to exercise a measure of control over quality during the curing process. Overlanding, the use of imports, and excessive delays in the factory before or after kippering have led to loss of quality of kippers. To improve quality, the Humber Laboratory instituted a quality-grading scheme in Hull that has resulted in the Herring Industry Board's assuming responsibility for an extension of the scheme to the entire herring industry.

This quality-assessment scheme for kippers may prove to be a useful pattern for cooperation between the fish industry and D.S.I.R. scientists in laying down reasonable standards of quality. Quality control at the port would probably be based on inspection of the raw fish on the market, supplemented when necessary by laboratory analyses and by any objective, quick market test that can be devised along the lines of the methylene blue test used for milk.

With a new outlook toward scientific research and quality control, industry may soon select and train personnel along more scientific lines.

8.0 THE CHEMICAL COMPOSITION OF FISH TISSUES

Love, R. M.; Lovern, J. A.; and Jones, N. R. (Torry Research Station, Aberdeen, Scotland)
Special Report No. 69 (1959) (Food Investigation, Department of Scientific and Industrial Research, London, England)

Introduction.--The concentrations of fish constituents are rarely the same from one fish to another. The two main factors responsible for variation are the spawning cycle and the food supply, and since the latter changes in different parts of the sea, the composition of the fish may also depend on the place of catching. Other causes of variation have been described in a recent review by R. M. Love (1957) to which the reader is referred for further details.

Since the individual investigations of fish constituents in different parts of the world have not been under a common directive, and since they have usually been performed solely from the standpoint of food technology, the results when viewed as a whole are unbalanced, certain constituents being given undue prominence because of their nutritive value, while other substances, such as intermediates in the metabolic cycle of the fish, have been almost ignored. For the same reason, nearly all analyses have been done on the muscle tissue and liver oil only so that previous compilers of reviews on fish composition could give very little extra information apart from a few data on gonads. Since about 1950, however, much more attention has been paid to other organs, and many analyses have been made from a biochemical standpoint. Thus for the first time it has been possible to make tables of composition on the basis of separate organs, rather than constituents, although it will be seen that figures for muscle composition still predominate.

Scope.--It has been thought desirable to omit all data on water, total protein, ash and inorganic substances, from considerations of space and because these have been covered, from the early 19th century to about 1946, in Vinogradov's great work (1953). For the convenience of readers, a brief

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9.16 OYSTER FARMING IN AUSTRALIA

Sardone, L. T.
World Fishing 8, 61-63 (September 1959)

Australia possesses the world's largest oyster farm, a 1,000-acre lease at Port Stephens, New South Wales. Australia also has the world's largest oyster bar--a 98-foot stretch in Flinders Street, Melbourne, Victoria, behind which 14 men open 2,000 dozen oysters every day.

Most of the oysters marketed in Australia are produced in New South Wales on oyster farms leased from the state government. The farms usually are situated in the lower reaches of rivers or in inlets from the sea. Production of oysters in New South Wales in 1956 to 1957 was about 10 million pounds. Only a small quantity of Australian oysters are exported, and imported oysters consist mainly of special varieties such as Japanese canned oysters.

The Sydney Rock Oyster, Saxostres commercialis, is neither confined to waters near Sydney, nor does it grow only on rocks. This oyster is cultivated along 1,300 miles of eastern Australian coastline, from the northern inlets of Victoria, down south, to Maryborough in the State of Queensland to the north.

Both stick and sandstone-slab methods of cultivation are used. Methods used at the Port Stephens oyster farm are representative of Australian oyster cultivation. The Port Stephens oyster farm extends over 1,000 acres of water-covered mud. The farm is divided into paddocks surrounded by tall fences of wire netting to prevent the entry of predators.

Stick method of cultivation.--Female oysters begin laying eggs when 6 months old. The larvae are carried about by the tides for about 2 weeks and then attach themselves to the wooden sticks. A

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 ABSTRACTER: Kathryn L. Osterhaug

9.14 NUTRITION OF SALMONOID FISHES VII. NITROGEN SUPPLEMENTS FOR CHINOOK SALMON DIETS

DeLong, Donald C.; Halver, John E.; and Mertz, Edwin T. (Western Fish Nutrition Laboratory, Cook, Washington)
Journal of Nutrition 68, 663-669 (August 10, 1959)

Introduction.--Recent studies of DeLong, Halver, and Mertz (1958) indicate that the protein requirement of chinook salmon (Oncorhynchus tshawytscha) is very high in comparison with that of other animals. This high protein requirement greatly increases the expense of purified diets in which all components are defined. Such diets, however, are desirable for use in fundamental nutrition studies. This study has been directed toward finding a relatively inexpensive source of nitrogen that is available in pure form. This study also provides information about the nitrogen metabolism of salmon for comparison with the nitrogen metabolism of warm-blooded animals.

Experimental.--The methods of diet preparation and general feeding were the same as those previously reported by Halver (1957). Diet 0, the basal diet, contained 20 percent crude protein made up of casein and gelatin and supplemented with an amino acid mixture to give the balance of indispensable amino acids found in whole egg protein. Diet 1 contained 40 percent of this balanced protein. Diets 2 to 5 contained 20 percent of the balanced protein and 20 percent of other sources of protein (nitrogen x 6.25) supplied only as L-arginine · HCl, glycine, urea, or diammonium citrate. Diets 1 to 5 were isonitrogenous.

For the feeding trial, six groups of 200 chinook salmon each, averaging 3.5 to 3.7 gm. per fish, were hand-counted into experimental hatchery troughs that were supplied with spring water at 58° F. The fish were fed a slowly sinking diet expelled through a garlic press into the upper portion of the

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 ABSTRACTER: Martin Heerdt

9.4 OPEN DAY AT TORRY LABORATORY

Anonymous
World Fishing 8, 56-58 (August 1959)

Although the work of scientists at the Torry Research Station, Aberdeen, Scotland, ranges from the handling of fish at sea on board their own trawler to pure biological research, their ultimate objectives are a better end product and improved economics of capturing, preserving, and processing fish.

Invisible smoke.--It recently was discovered at Torry that the solid particles that make smoke visible take no part in the smoke-curing process. If the visible particles are removed by an electrostatic separator, the remaining vapor effects an efficient cure without discoloring the fish or polluting the atmosphere.

The electrostatic separator consists of a series of plates that carry a high voltage potential. The electrical potential ionizes the smoke particles and attracts them to the plates from which they are drained away in the form of a thick tarry substance. The now invisible smoke is fluidized by means of a scrubber. It is hoped that this fluid can be added to a brine-dipping solution to permit curing without using a smoke kiln.

Electron microscope.--New equipment at the Torry Station includes an electron microscope that makes it possible to study organisms too small to be seen with a conventional microscope. Magnification up to 160,000 diameters is available.

Dielectric thawing.--Although the freezing of fish has become a scientific and controlled

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 ABSTRACTER: Kathryn L. Osterhaug

9.14

water. Fish were fed three times daily on a rigid schedule, and each feeding was continued as long as the fish accepted food. The entire population of each trough was weighed biweekly. At the end of the 6-week experimental period, samples were taken for gross examination of various organs and tissues, for histological examination, and for proximate analysis by the method of Wood et al. (1957).

Results.--A summary was prepared to show the average gain in weight that resulted from the feeding of each diet containing a nitrogen supplement to salmon fingerlings for a period of 6 weeks. Weight gains obtained on the 40-percent balanced protein diet were 2.7 times the weight gains obtained on the 20-percent balanced protein diet or basal diet. When the basal diet was supplemented with 20 percent protein in the form of L-arginine • HCl, glycine, and urea, respectively, the average gain was 2.0, 1.4, and 0.0 times that obtained on the basal diet. Supplementation with diammonium citrate caused a weight loss. Mortality in all lots of salmon was very low. Representative gross post-mortem examination, histological examination, and proximate analysis failed to show any change among the lots of salmon.

Discussion.--The diets used in this study with salmon differed from those used in studies with rats in that the diets used with salmon contained some whole protein, which supplied some of the nonessential amino acids. Arginine produced maximum gain when used as a supplement in the diets of both rats and salmon. The growth experienced by salmon and rats on the arginine-supplemented diet that contained 40 percent protein (diet 2) was not as good as the growth experienced on the 40 percent balanced protein (diet 1), which might indicate that one of the essential amino acids in the 20 percent balanced protein diet was limiting. Rats were about equal to the salmon in ability to utilize glycine. Urea in the diet of the rat permitted only 40 percent of the weight gain obtained with arginine-supplemented diet (Birnbaum, Winitz, and Greenstein 1957), whereas urea showed no growth-promoting action in the studies with salmon. Ammonium salts, when used as a supplement to the basal diet of rats, gave weight gains equal to 80 percent of that obtained with arginine-supplemented rations. In contrast, ammonium salts depressed the growth of the salmon.

9.4 (Cross Reference: 3.231, 3.4)

operation, the commercial thawing of frozen fish is a crude process and often harmful to the fish.

Scientists at the Torry Station believe that they have found the answer to this problem through the use of commercially manufactured equipment that is inexpensive to operate and costs no more initially than freezing equipment of equal capacity.

The process is known as dielectric thawing, and works on the theory that if two plates charged with a high voltage, high frequency, alternating current are placed near each other they will generate heat in any material that occupies the space between them. The heat is generated throughout this dielectric material and not merely on the surface.

After considerable experimentation it was found that blocks of fish up to a certain thickness can be thawed satisfactorily in 15 to 20 minutes by this procedure.

8.0

summary of the latter is given in the first table. Total fat has been omitted, since it varies so much according to the nutritional status of the fish and to the solvent used in extraction. Some of the literature on the free amino acids has not been fully reviewed; the material given was prepared for another purpose.

The preparation of the sample has guided the selection of material: for glycogen, ATP, etc., the only results considered significant have been those obtained from fish caught by hand-line or taken from an aquarium and analyzed immediately after death. Figures for nitrogenous extractives have only been considered if absolute freshness of the fish was specified in the paper, and in all other cases the only results abstracted were those relating to fresh or in some cases frozen muscle (for combined amino acids and vitamins). In no instances have results of cooked, canned, dried, salted, or smoked fish been used, nor have those obtained by analytical methods considered unreliable. Figures showing the concentration of substances in the entire fish have been rejected, as have those relating to substances in flesh- or liver-oil where the concentration of oil in the original organ was not stated. This incidentally eliminated a large proportion of the values for vitamin D.

Contents.--Tabular data are presented on the composition of the following organs and substances of fish: adrenal, alimentary canal, bile, blood, brain and spinal cord, dark muscle, egg, electric organ, embryo, eye, gall bladder, gills, gonad, heart, kidney, liver, muscle, diploid nuclei, pancreas, scales, shell gland, skin, spleen, thymus, uterus. Data on mineral composition are given separately.

References.--A total of 183 references are cited.

9.16 (Cross Reference: 1.81)

few months later the sticks are removed to brackish water deep inside the bay to so-called growing paddocks where they are nailed on horizontal rows at 10-inch intervals. The height of the rocks in the growing paddocks is calculated so that the oyster grows at a point half-way between high and low water mark.

Sandstone slab method cultivation.--In the rock cultivation of oysters, only easily worked rocks such as sandstone and loose shales are used. Oysters catch well on other rocks but are extremely difficult to remove when mature.

In rocky foreshore leases, the rock is often cut from local stone in sizes measuring roughly 1 foot by 2 feet by 4 inches, which is a size of rock that is easily handled. Four chief methods are used to put out the stone:

1. Two or three stones may be piled together to support each other at about a 70 degree angle to the bottom.
2. On rather soft ground the bottom may be hardened by the addition of sand, gravel, small rocks, old shells and so forth, over which are placed lengths of hardwood timber upon which the rocks are put with the long axis horizontal.
3. The rocks may be lifted above the bottom on racks similar to but narrower than those used for sticks.
4. The rocks may be held above the bottom on tripods of small stakes thrust in the ground.

The heavy spat-catch occurs on the lower surface of the rocks. The rocks sometimes are turned over so that spat may be caught on the remaining surfaces.

Tray cultivation.--The principle of tray cultivation is to lift the oysters above the bottom where they are most susceptible to attack from various pests and to being smothered by silt or sand. The tray method is used in conjunction with one of the cultch methods in order to obtain the spat. The oysters are generally held in the trays for no more than 9 months before they are marketed and therefore must be in a fairly advanced state of growth when put on the trays.

0.36 CHANGES IN pH, CARBONATE AND LACTATE OF THE BLOOD OF YEARLING KAMLOOPS TROUT, SALMO GAIRDNERI, DURING AND FOLLOWING SEVERE MUSCULAR ACTIVITY

Black, Edgar C.; Chiu, Wing-Gar; Forbes, Francis D.; and Hanslip, Arthur
Journal of the Fisheries Research Board of Canada 16, 391-402 (August 1959)

Fifteen minutes of strenous exercises by yearling Kamloops trout caused a significant increase in the blood level of lactate but no alteration in hemoglobin composition. The blood level of carbonate increased during the first 3 minutes of muscular activity to the highest value encountered and then dropped precipitously until the 30th minute of recovery. The hydrogen ion concentration of the blood increased sharply during the first 3 minutes of activity as did the lactate and carbonate concentration. A very marked reduction in the swimming rate was correlated with these changes.

0.36 FATIGUE AND MORTALITY IN TROLL-CAUGHT PACIFIC SALMON (ONCORHYNCHUS)

Parker, R. R.; Black, E. C.; and Larkin, P. A.
Journal of the Fisheries Research Board of Canada 16, 429-446 (August 1959)

Coho and chinook salmon that are feeding are subject to hyperactivity if captured by trolling. This type of capture may lead to a distressed condition or death, and death cannot be predicted from examination of individual fish at time of capture. Mortality of coho was estimated to be in the range of 34 to 52 percent. The time of maximum death rate of coho is shown to coincide with the period of maximum blood lactate response. Survival occurred either when blood lactate did not reach critical levels (above 125 mg. percent) or reached critical levels and subsequently subsided.

2.143 LEADING ADULT SQUAWFISH (PTYCHOCHEILUS OREGONENSIS) WITHIN AN ELECTRIC FIELD

Maxfield, Galen H.; Liscom, Kenneth L.; and Lander, Robert H. (Bureau of Commercial Fisheries, Seattle 2, Washington)
Special Scientific Report: Fisheries No. 298, 15 pp. (April 1959) (Bureau of Commercial Fisheries, Fish and Wildlife Service, Washington 25, D. C.)

Research has been directed toward the development of an electrical trapping device employing the principle of electrotaxis. The objectives of the study were to determine by systematic testing: (A) the optimum values of the electrical variables of (1) potential (60, 75, and 90 volts), (2) pulse frequency (2, 5, and 8 pulses per second), and (3) pulse duration (10, 20, and 30 milliseconds) for leading adult squawfish within an electrical array; and (B) the possible significance of the direction of movement of the electrical fields. Pulse frequency was found to be the most critical variable (optimum, 2 pulses per second). Potential was also significant (optimum, 60 volts), but pulse duration was not significant, at least in the range tested.

2.143 THE ELECTRIC MID-WATER TRAWL

Russel, Jay
Maine Coast Fisherman 13, 12 (June 1959)

(Abstract of this article appears under 2.1121 page 3 - October 1959)

2.3 SOFTENING FREE FISH BONES BY CHEMICAL AGENTS

Khuda, M. Q.; Fazl-i-Rubbi, S.; and Khan, N. A. (East Regional Labs., Dacca, India)
Pakistan J. Sci. Research 10, 144-8 (1958)
Chemical Abstracts 53, 14376h (August 10, 1959)

The results of softening treatments on free fish bones with 38 different chemicals are recorded.

2.3 FISH-BONE DETECTION DEVICE SHOWS PROMISE

Anonymous
Commercial Fisheries Review 21, 32 (April 1959)

An automatic detector-rejector device that will "spot" bone-bearing fish fillets and eject them from the conveyor line is now a probability, the Department of the Interior reported.

3.19 USE OF γ-RADIATION PRESERVATION OF FISH PRODUCTS

Bidenko, M. S.
Rybnoe Khoz. 34, No. 5, 52-6 (1958)
Chemical Abstracts 53, 1579d (January 25, 1959)

In order to establish the sterilization dose and its effect on the quality of products, specimens were treated after 1 day of storage at 0° with 0.2, 0.6, 1.0, and 1.5×10^6 r.e.p. CO^{60} γ-radiation.

3.19 EFFECTS OF SOME POSTIRRADIATION TREATMENTS ON THE SURVIVAL OF BACTERIA IRRADIATED WITH ^{60}CO GAMMA RAYS--I.

Kadota, Hajime; Miyoshi, Hideo; and Shibata, Hiromu
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 12, 1001-1007 (1959) (English abstract and figures)

The present work is concerned mainly with the effects of some postirradiation treatments on the growth of several food micro-organisms and Escherichia coli irradiated with gamma rays from cobalt-60. The effects of postirradiation treatments on the survival of bacteria differ entirely with the species. These effects generally decrease with an increase in the number of nutritional substances required for bacteria.

GLOSSARY OF COMMON AND SCIENTIFIC NAMES OF FISH AND SHELLFISH*

Common name	Other common names	Scientific name
Alewife	Branch herring, big-eyed herring, river herring,	Pomolobus pseudoharengus
	Blueback, glut herring, shad herring	Pomolobus aestivalis
Anchovy		Engraulis mordax
Cod	Codfish	Gadus morhua (Atlantic)
		Gadus macrocephalus (Pacific)
Flounder:		
Gray sole		Glyptocephalus cynoglossus
Lemon sole		Pseudopleuronectes dignabilis
Yellowtail	Dab	Limanda ferruginea
Dab	Sea dab	Hippoglossoides platessoides
Blackback	Winter flounder	Pseudopleuronectes americanus
Fluke	Summer flounder, gulf flounder, flounder	Paralichthys species
'Sole'		Pleuronectidae and Bothidae species
'California halibut'		Paralichthys californicus
Haddock		Melanogrammus aeglefinus
Halibut		Hippoglossus hippoglossus (Atlantic)
		Hippoglossus stenolepis (Pacific)
Herring:		
Lake	Herring	Leucichthys artedi (Great Lakes, except Erie)
Round		Etrumeus sadina
Sea		Clupea harengus (Atlantic)
Thread		Clupea pallasii (Pacific)
		Opisthonema oglinum
Jack mackerel	Horse mackerel	Trachurus symmetricus
Lingcod	Cultus cod, blue cod, buffalo cod, ling	Ophiodon elongatus
Mackerel		Scomber scombrus (Atlantic)
		Pneumatophorus diego (Pacific)
Crab:		
Blue		
Hard	Hard-shelled crab	Callinectes sapidus
Soft and peelers	Soft-shell crab	Callinectes sapidus
Dungeness		Cancer magister
King	Alaska king crab	Paralithodes camtschatica
Rock		Cancer irroratus (New England)
		Cancer species (California)
Stone		Menippi mercenaria
Lobster:		
Northern		Homarus americanus (Atlantic)
Spiny	Sea crawfish, rock lobster	Panulirus argus (Atlantic)
		Panulirus interruptus (Pacific)
Shrimp	Prawn	Penaeus setiferus (South)
		Penaeus duorarum (Atlantic)
		Penaeus aztecus and Xiphopeneus kroyeri Gulf)
		Pandalus species (Atlantic and Pacific)
		Pandalopsis species (Pacific)
		Crago species (Pacific)

Common name	Other common names	Scientific name
Menhaden	Mossbunker, pogy, fatback	Brevoortia species
Mullet	Jumping mullet, striped mullet, silver mullet	Mugil species
Ocean perch:		
Atlantic	Rosefish, redfish, red perch	Sebastes marinus
Pacific		Sebastodes alutus
Pilchard	Sardine	Sardinops caerulea
Pollock	Boston bluefish	Pollachius virens
Rockfish	Rock cod, snapper	Sebastodes species (Pacific)
Sablefish	Black cod	Anoplopoma fimbria
Salmon:		
Atlantic		Salmo salar (Atlantic)
Pacific:		
Chinook or king	Tyee, spring	Oncorhynchus tshawytscha
Chum or keta	Fall, dog	Oncorhynchus keta
Pink	Humpback	Oncorhynchus gorbuscha
Red or sockeye	Blueback	Oncorhynchus nerka
Silver or coho		Oncorhynchus kisutch
Spanish mackerel	Mackerel	Scomberomorus maculatus
Tuna and tunalike fishes:		
Albacore	Longfin tuna	Germo alalunga
	---	Thunnus saliens
Bluefin	Horse mackerel	Thunnus thynnus
	---	Thunnus secundodorsalis
Bonito		Sarda sarda (Atlantic)
		Sarda chiliensis (Pacific)
Little	Bonito, albacore, false albacore	Euthynnus alletteratus
Skipjack	Striped tuna	Katsuwonus pelamis
Yellowfin		Neothunnus macropterus
Whiting	Silver hake	Merluccius bilinearis
Clam:		
Cockle		Cardium corbis (Pacific)
Coquina	Pompano shells	Donax variabilis
	Butter	Saxidomus nuttali (Pacific)
Hard	Little neck	Paphia staminea (Pacific)
	Round clam, cherrystone, quahog, little neck	Venus mercenaria (Atlantic)
		Venus mortoni (Florida)
Ocean quahog		Cyprina islandica
Pismo		Tivela stultorum (Pacific)
Razor		Ensis species (Atlantic)
		Siliqua patula (Pacific)
Soft	Soft-shell clam, sand clam, nannynose, maninose	Mya arenaria
Surf	Skimmer	Spisula solidissima
Oyster:		
Eastern	Cove	Crassostrea virginica
Pacific (introduced)	Japanese	Crassostrea gigas
Western	Olympia, native	Ostrea lurida
Scallop:		
Bay		Pecten irradians (Atlantic)
		Pecten aequisulcatus (Pacific)
Sea		Pecten magellanicus

* Taken from Fishery Statistics of the United States 1955. Each species listed was caught in excess of 10,000,000 pounds in 1955.

4.0 CHARACTERS OF SOME OILS AND FATS OF ANIMAL ORIGIN. II. OILS AND FATS OF MARINE ANIMALS

Carola, C. (Staz. sperim. olii e grassi, Milan)
Olii minerali, grassi e saponi, colori e vernici 34, 382-90 (1957)
Chemical Abstracts 51, 18656 (November 25, 1957)

Chemical and physical properties of the following marine animal oils and fats are reported: herring oil, whale oil, dolphin oil, cod-liver oil, seal oil, menhaden oil, sardine oil, Japanese-sardine oil, tuna fish oil, tuna-liver oil.

4.0 FIFTY YEARS OF PROGRESS IN THE UTILIZATION OF INEDIBLE FATS AND OILS

Scofield, Francis (National Paint, Varnish, and Lacquer Association, Washington, D. C.)
Journal of the American Oil Chemists' Society 36, 436-438 (September 1959)

4.0 ADVANCES IN FAT RESEARCH IN SPAIN DURING THE LAST FIFTY YEARS

Moreno, J. M. Martinez (Instituto de la Grasa y sus Derivadas, Seville, Spain)
Journal of the American Oil Chemists' Society 36, 427-431 (September 1959)

Topics include: the Spanish contribution as seen in chemical abstracts, contribution to general chemistry and fat analysis, chemical composition of fats and related products, physicochemical studies, fat fractionation and analysis, studies on olive oil and its technology, the institute of fats in Seville, and Spanish bibliography on fats.

4.19 THE HETEROGENEITY OF OSTREASTEROL AND CHALINASTEROL

Idler, D. R. and Fagerlund, U. H. M. (Fisheries Research Board of Canada, Technological Station, Vancouver, B. C.)
Chemistry and Industry No. 14, 432 (April 6, 1957)
Studies 1957 from the Stations of the Fisheries Research Board of Canada, FRB No. 475 (1958) (Ottawa)

"Ostreasterol" isolated from the Atlantic oyster Crassostrea virginica is believed to be identical to "chalinasterol" isolated from several sponges and assigned the structure $\Delta^{5,22}$-campestadien-3β-ol. The sterols of the Pacific oyster Ostrea gigas may be separated with difficulty by chromatography of the p-phenylazobenzoyl esters into 36 percent 24-methylenecholesterol, 30 percent one double-bond sterol, 29 percent two double-bond sterol, and 5 percent of a sterol having conjugated diene structure.

4.19 COMPONENT ACIDS OF INDIAN FRESH WATER FISH (NOTOPTERUS CHITALA) VISCERAL OIL

Pathak, S. P. and Trivedi, B. N. (Banaras Hindu Univ., Varanasi)
Indian J. Appl. Chem. 21, 157-61 (1958)
Chemical Abstracts 53, 16402a (September 10, 1959)

4.11 SEPARATION AND IDENTIFICATION OF LIPIDES

Schlenk, Hermann
Annual Report of The Hormel Institute 1956-57, pp. 43-46 (1957)

Paper chromatography of brominated fatty acids and esters contributes to the qualitative analysis of their mixtures. Esterification of fatty acids with diazomethane can be carried out using semi-micro amounts of methylamine hydrochloride as the starting material. This will permit quantitative paper chromatography without applying chemical indicators. Proof has been given of the presence of n-pentadecanoic acid, and of an isomer of this acid, in menhaden oil fatty acids.

4.11 STUDIES ON THE PHOSPHATIDE OF AQUATIC ANIMALS--XIX. LIPIDS OF THE BODY TISSUES OF HERRING, CLUPEA PALLASII

Katada, Muneo; Zama, Koichi; and Igarashi, Hisanao
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 11, 905-908 (1959) (English abstract and tables)

Chloroform/methanol (2:1), hot ethanol, ethanol/benzene (32:68), and ethanol/ethyl ether (3:1) were suitable for extracting various lipids including sphingolipids from herring tissue. Dark-colored muscle and liver were found to contain the highest concentration of lipids.

4.61 APPLICATION OF SOME ANTIOXIDANTS TO BOILED AND DRIED IKANAGO (AMMODYTES PERSONATUS GIRARD) AND ANCHOVY (ENGRAULIS JAPONICUS T. & S.)

Isa, Yoshinobu
Bulletin of the Japanese Society of Scientific Fisheries 23, No. 9, 585-588 (1958) (English abstract and tables)

Dried ikanago was preserved in a good condition at room temperature if 0.01 percent BHA was added to the cooking water.

4.61 METHOD OF PROTECTION OF MARINE PRODUCTS FROM DETERIORATION DUE TO OXIDATION OF OIL V. STUDIES ON THE SALTED HERRING CAUGHT AT NORTH OKHOTSK SEA

Uno, Tsutomu and Nakamura, Masayoshi (Hokkaido Doritsu Fishery Exptl. Sta.)
Hokusuishi Geppo 15, 86-91 (1958)
Chemical Abstracts 52, 15775 (September 25, 1958)

Butylated hydroxyanisole was more effective than butylated hydroxytoluene for the prevention of rancidity of salted herring.

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7.595 AN IMPROVED CYLINDER PLATE ASSAY METHOD FOR DETERMINATION OF CHLORTETRACYCLINE IN FISH TISSUES

Tomiyama, Tetuo; Tsuda, Atsushi; and Yone, Yasuo
Bulletin of the Japanese Society of Scientific Fisheries 24, No. 4, 289-295 (1958)

An improved cylinder-plate method for determination of chlortetracycline in tissues has been presented. A mixture of acetone and citrate buffer has been employed for the extraction of chlortetracycline from sample tissues and also as the diluent of the standard chlortetracycline solution. The method is superior in recovery and sensitivity to the FDA method and the UMEZAWA et al. modified method. It was found that the average recovery of chlortetracycline from tissues and minimum inhibitory concentration were 95 percent and 0.002 mcg. per cc., respectively.

7.595 DETERMINATION OF RESIDUAL QUANTITIES OF CHLORTETRACYCLINE IN FISH

Dubrova, G. B.; Ravich-Shcherbo, Yu. A.; and Onikienko A. Ya. (Sci-Research Inst. Mech. Fish Ind., Leningrad)
Voprosy Pitaniya 17, No. 4, 53-7 (1958)
Chemical Abstracts 53, 600e (January 10, 1959)

In order to enlarge the zones of delayed growth in the methods based on diffusion of chlortetracycline (CTC) into agar it is demonstrated that a decrease of the amount of cells of the test culture (Bacillus subtilis strain L_2 and B. cereus varied mycoides, strain 20) and the addition of 0.5 ml., 1 percent $CuSO_4$ and 0.05 ml., 2 percent $MnSO_4$ to each petri dish containing Hottinger agar, increases the accuracy of the CTC determination in various fish products. CTC should be extracted from fish tissue ground in a citrate-HCl buffer solution of pH 3.5. The experiments described in this paper present quantity determinations of CTC in the amounts as small as 0.02 to 0.04 γ/g. fish tissue.

8.42 BIOCHEMICAL STUDIES ON THE GROWTH AND MATURATION OF FISH ORGANS. VI. THE CONTENTS OF IRON, COPPER, AND ZINC IN THE OVARIES OF YELLOWFIN TUNA

Higasa, Shichiro and Suzuki, Akimi (Nankai-ku Suiken, Kochi)
Nankai-ku Suisan-kenkyusho Hokoku 6, 41-5 (1957)
Chemical Abstracts 52, 14878 (September 10, 1958)

VII. The contents of iron and copper in the ovaries and livers of yellowfin tuna, striped marlin, and sail fish. -- Ibid. 53, 17350a (September 25, 1959). Iron and copper content of the ovaries in yellowfin tuna, striped marlin, and sail fish decreased progressively during development of the ovaries and increased rapidly after the fish had spawned.

8.42 THE OCCURRENCE OF GALLIUM IN MARINE ORGANISMS

Culkin, F. and Riley, J. P. (Univ. Liverpool, Engl.)
J. Marine Biol. Assoc. United Kingdom 37, 607-15 (1958)
Chemical Abstracts 53, 17345a (September 25, 1959)

The gallium content of various organs of Pecten maximus, Buccinum undatum, Chlamys opercularis, and Porania pulvillus was 0.07 p.p.m., but gallium was higher in viscera and digestive organs.

8.64 BIOCHEMICAL STUDIES ON THE GROWTH AND MATURATION OF FISH ORGANS. III. VITAMIN B_{12} CONTENTS OF FISH ORGANS

Shimidu, Yasuyuki (Nankai-ku Suiken, Kochi)
Nankai-ku Suisan-kenkyusho Hokoku 6, 18-24 (1957)
Chemical Abstracts 52, 14878 (September 10, 1958)

IV. Vitamin B_2 contents in liver and ovaries of yellowfin tuna.

8.64 STUDIES ON VITAMIN B_{12} IN SEA WATER IV. ELECTRODIALYSIS OF SEA WATER AND THE STABILITY OF VITAMIN B_{12} IN SEA WATER

Kashiwada, Ken-ichi; Kakimoto, Daiichi; Kanazawa, Akio; Kawagoe, Kazunori; and Kubo, Motoko
Bulletin of the Japanese Society of Scientific Fisheries 24, Nos. 6 and 7, 591-597 (1958) (English abstract, figure, and tables)

Desalting of sea water could be accomplished in less time by electrodialysis than by running water dialysis. The loss of vitamin B_{12} in sea water proceeds with considerable velocity in diffused daylight. This loss may be avoided almost completely if the sea water is kept in brown light or in the dark. Intentional neutralization or acidification of natural sea water lessens the rate of loss of vitamin B_{12} in diffused daylight. The vitamin B_{12} content of sea water being exposed to the sun decreased very rapidly.

9.13 METABOLIC PATTERNS IN BIVALVES XI. XANTHINE DEHYDROGENASE IN VENERUPIS PHILIPPINARUM, MACTRA SULCATARIA, ANADARA INFLATA, OSTREA GIGAS, MERETRIX MERETRIX LUSORIA AND MYTILUS EDULIS

Tsuzuki, Kiyoshi (Chiba Univ.)
J. Coll. Arts. Sci. Chiba Univ., Nat. Sci. Ser. 2, 239-42 (1957)
Chemical Abstracts 52, 15759 (September 25, 1958)

A qualitative study of enzyme activity was obtained by incubating homogenates of selected tissues with hypoxanthine and methylene blue in Thunberg tubes.

9.13 THE UPTAKE OF STRONTIUM BY MARINE FISH FROM VARIOUS CONCENTRATIONS OF CALCIUM AND STRONTIUM IN THE ENVIRONMENT

Ichikawa, Ryushi and Hiyama, Yoshio (Univ. Tokyo)
Records Oceanog. Works Japan 4, 55-66 (1957)
Chemical Abstracts 53, 3513c (February 25, 1959)

Gobioid fishes were reared in sea water to which had been added various amounts of strontium[90] and calcium. The higher the concentration of strontium in the environmental water, the greater the uptake by fish tissues.

United States
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Fish and Wildlife Service
Bureau of Commercial Fisheries
Washington 25, D. C.

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